The Electrical Industry's Weekly Magazine

October 29, 1956

Electrical World

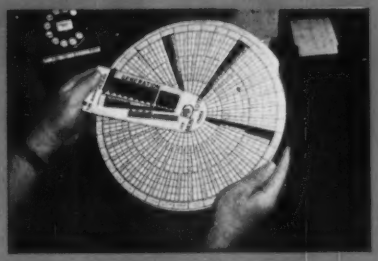
Price 35 Cents

A McGraw-Hill Publication

How to Cut

Tomorrow's Costs

...page 77



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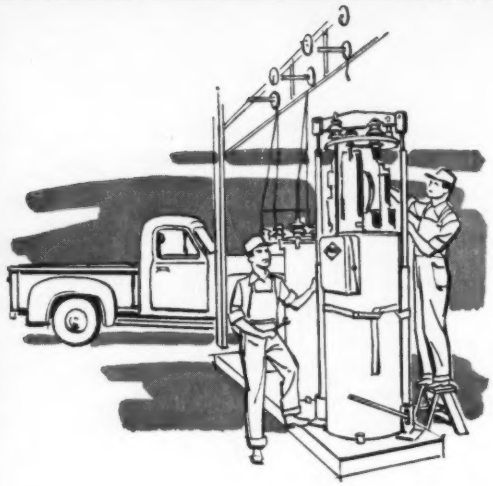
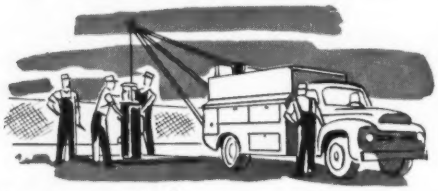
Compare Allis-Chalmers Regulators with Others

Slash Regulator Service Costs 75%



THIS

On-the-spot service with Allis-Chalmers cover-suspended regulators—2-man crew and pickup truck does the job without moving unit.



OR THIS

Other regulators usually require a 4 or 5-man crew and boom truck to move regulator and do piecemeal untanking and retanking.

1—Drain oil from tank

2—Remove cover, bushings and control leads

3—Piecemeal untanking

Eliminates need for moving and piecemeal untanking which costs 4 to 5 times more!

This is the key to savings with Allis-Chalmers regulators! Unit construction makes it possible. A 2-man crew using a pickup truck (not a boom truck) can switch the regulator off the line, set up the portable hydraulic jack and in a few minutes lift the entire regulator mechanism far enough out of the tank for inspection. Only Allis-Chalmers regulators provide full unit construction.

For complete information, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

LIVE BETTER ELECTRICALLY

ALLIS-CHALMERS

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 146, No. 18 **October 29, 1956**

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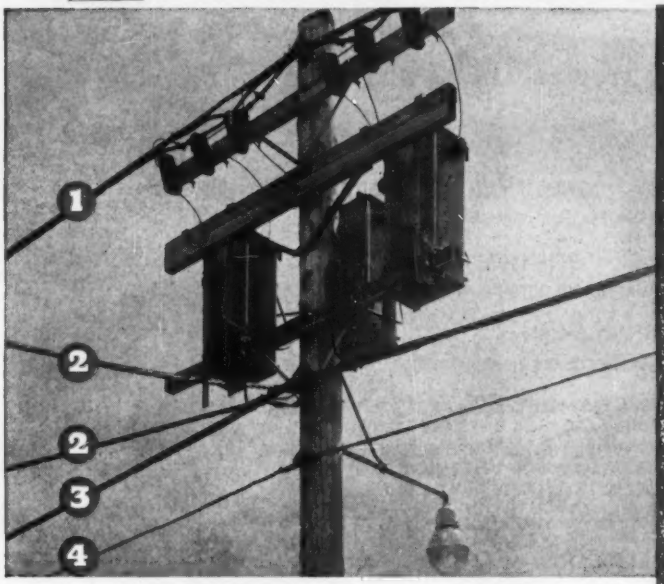
4 applications for OKOLITE-OKOPRENE *aerial cables*

. . . with these 16 advantages



1—PRIMARIES, 2—SERVICES, 3—SECONDARIES, 4—LIGHTING CIRCUITS—all on one pole at Bonneville, Oregon.

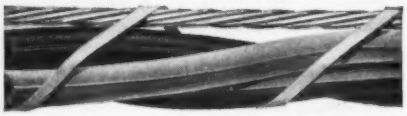
- Most utility engineers now recognize the advantages of aerial cables for primary circuits. Moreover, many are now using this economical cable design for street lighting circuits, for secondaries—including networks—as well as for service drops. For such installations, time-proved Okolite-Okoprene aerial cables—whether self-supporting, ring-supported or spinner-lashed—offer many advantages.

The patented Dualay* assembly, originally designed by Okonite engineers for hot-tapping of Okolite-Okoprene self-supporting primary cables, is also of distinct value for secondary circuits, since services can be taken off at any point, even in mid-span, without racks or spreaders.

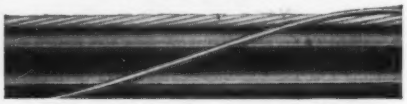
In addition to their suitability for utility overhead systems, Okolite-Okoprene aerial cables are extensively used by industrial plants and railroads for power, lighting, communication and control systems. Details on the many types available, with complete data on selection and installation, are available in Bulletin EW1074. The Okonite Company, Passaic, N. J.

*Hot tap feature: in the Dualay method (U.S. Pat. 2,430,378) the insulated conductors are twisted together so that the direction of lay is reversed at regular short intervals to permit conductor separation without cutting the copper or performing any operation on the messenger.

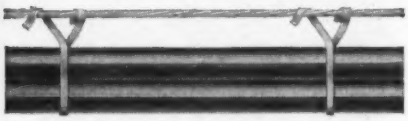
- **Improved circuit regulation and lower voltage drop through lower reactance.**
- **Tree trimming reduced or eliminated.**
- **Overlength poles not needed to clear treetops.**
- **Fewer service interruptions or outages.**
- **Reasonable original cost.**
- **Lower maintenance cost.**
- **Simple to install.**
- **Higher safety factor for linemen, people and property.**
- **Good appearance.**
- **No festooning.**
- **Long spans.**
- **Less congestion on poles.**
- **Elimination of cross-arms.**
- **Reduced clearance space near buildings and other structures.**
- **Greater reliability in storms—resist wind, icing, moisture—operate even if poles are down.**
- **Messenger serves as neutral.**



Okolite-Okoprene *Self-Supporting* Aerial Cable with in-built messenger. Made with Dualay* design for easy tapping.



Okolite-Okoprene cables can be lashed to messenger by the *spinner method*.

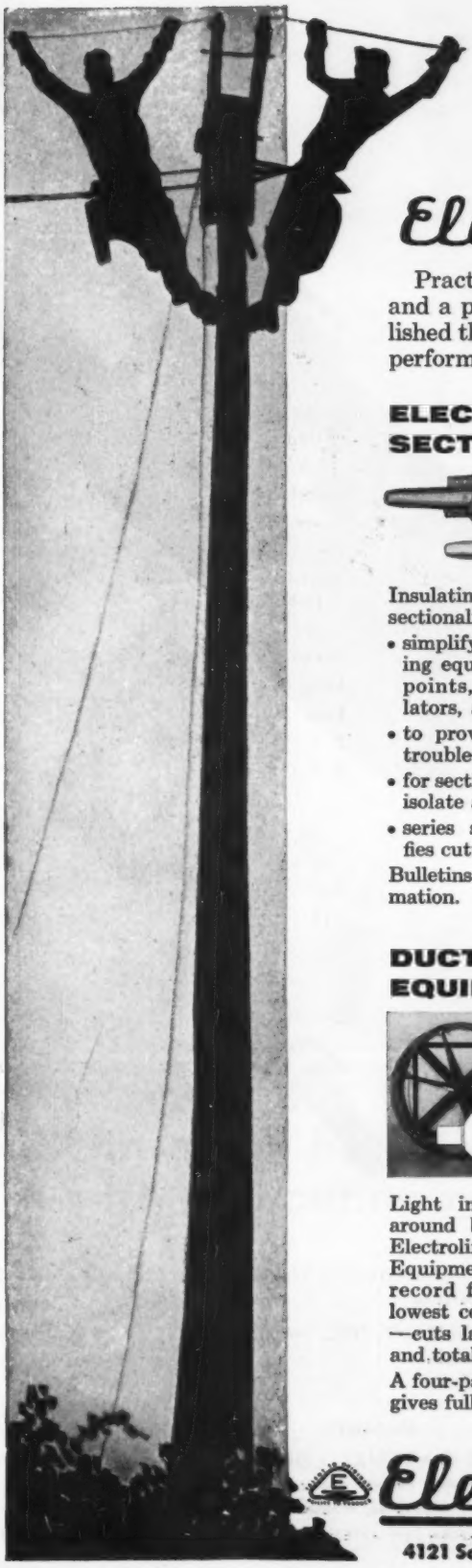


Okolite-Okoprene cables may be installed in regular *messenger rings*.

Available with either copper or aluminum conductors

OKONITE OKONITE SINCE 1878 ***insulated cables***

3229

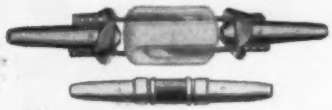


for the largest number of line applications, at the lowest possible cost . . .

Electroline Products

Practical experience designed these Electroline Products; and a practical habit of keeping close tab on costs has established them as first in the field—for top quality and economical performance.

ELECTROLINE SECTIONALIZERS

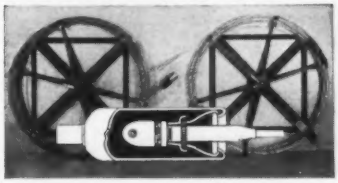


Insulating automatic line splice sectionalizers:

- simplify cutting-in of regulating equipment—disconnecting points, fuses, voltage regulators, series capacitors, etc.
- to provide points to test for trouble
- for sectionalizing networks—to isolate and test area in trouble
- series street lighting—simplifies cutting-in series lamps

Bulletins contain complete information.

DUCT-RODDING EQUIPMENT



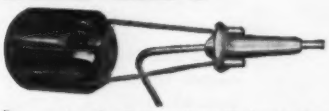
Light in weight, feeds easily around bends, easy to handle. Electroline Steel Duct-Rodding Equipment has an extraordinary record for high efficiency at lowest cost. A big money-saver—cuts labor cost, original cost and total investment.

A four-page illustrated brochure gives full information.

AUTOMATIC LINE SPLICES

It is well said of these simple, rugged units—"They go on in no time; they hang on for all time." Easy to install—and their mechanical strength exceeds the rated breaking strength of the conductors. Ideal for restoring service.

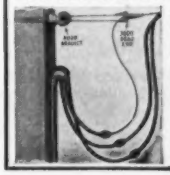
AUTOMATIC DEAD-ENDS



In a typical "torture" test for strength, gripping and vibration damping features, 100,125,000 recorded vibrations did not develop any sign of failure of conductor in these rugged dependable Dead-Ends. Engineers call it equivalent to 50 years of ordinary service.

Electroline Service-Drop Automatic Dead End. The "3800" Series for holding pre-assembled service cable using a bare neutral conductor as the messenger.

The method of gripping the bare neutral employed by this ELECTROLINE Anchorage eliminates the danger of short circuiting the phase wires so common with the use of concentric cable clamps.



ELECTROLINE Service-Drop Anchor Bracket. The "4000" Series for securely supporting the cable at any angle.

Electroline Company

4121 So. LaSalle St., Chicago 9, Ill. In Canada: POWERLITE DEVICES, LTD., TORONTO

Fargo's new compression connector is easiest to use

FOR SERVICE ENTRANCE connections, here's a connector that's a whopping improvement. It is octagonal instead of round . . . gives a completely tight and dependable connection with far less effort. A new "one-handed" tool (shown at right) has been developed for use with this connector, but other tools may be used. As pressure is applied to the octagon shape the high points compress first and fill the interstices of the conductor with metal.

The Fargo Compression Connector is made of aluminum and has a dividing wall at the exact center. Delivered to you grease-filled, the wall forces the grease back through the lay of the conductors as they are inserted and seals out corrosive media. The wall also reduces bi-metallism and controls the length of conductor inserted so each side has identical holding power.

Each connector is color-coded for size by means of colored plastic grease retaining caps, and the size is also legibly stamped on the body itself.

Fargo Aluminum Octagonal Connectors are available in a complete range of sizes from 8 sol through 2 ACSR.

ASK YOUR LINE MATERIAL FIELD ENGINEER FOR COMPLETE DETAILS

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

Distributed by
LINE MATERIAL COMPANY
(A McGraw Electric Company Division)
Milwaukee, Wisconsin
In Canada, CANADIAN LINE MATERIALS, LTD., Toronto, Canada

LM

DEMONSTRATION of slack in conductors is shown when Anaconda preassembled reverse-lay aerial cable is untwisted. Opened cables enable linemen to make connections easily—without cutting conductors or messenger.

Built-in slack helps linemen make quick taps —with Anaconda reverse-lay aerial cable

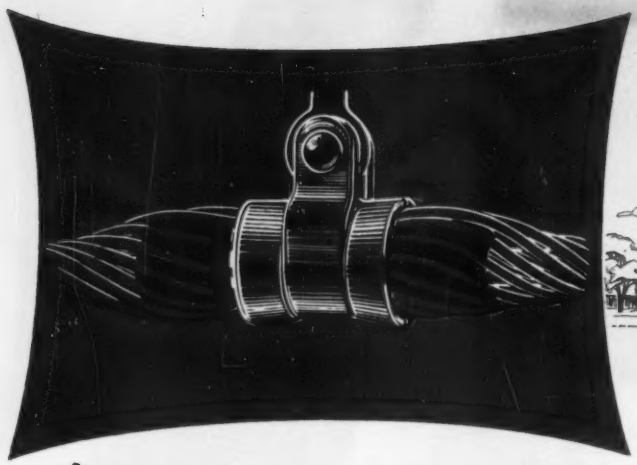
When transformers, cutouts or laterals make numerous connections necessary — Anaconda reverse-lay aerial cable permits easy separation of conductors whenever the need arises.

Lay of the conductors is reversed approximately every five feet — within easy reach of linemen. Unwound between reversal points, conductors have sufficient slack to eliminate the need for cutting conductor or messenger when making connections.

"Hot" taps can be made on 5kv nonshielded cables, eliminating power shutdowns. Opened cable allows use of wire guards and rubber blankets between the conductors for greater safety.

Ask the Man from Anaconda for full details. Call or write to: Anaconda Wire & Cable Company, 25 Broadway, N. Y. 4, N. Y.

SEE THE MAN FROM **ANACONDA®**
FOR **AERIAL CABLE**



"PERFECTING not PERFECTION is our goal"*

Yesterday's answers are not good enough. Today's will need improving tomorrow.

Take the problem of vibration fatigue. Failure of strand because of vibration or galloping does not occur in mid span. But it becomes a real problem at points of stress concentration, such as the end of the clamp keeper—at mass concentrations, such as at clamps, dampers and rigid splices—or at wearing points at loose attachments or fastenings.

Yesterday's answer—PREFORMED ARMOR RODS introduced by Preformed Line Products Company in 1947.

Today's answer—PLP PREFORMED ARMOR with pitch direction the same as conductor strand and pitch length less than that of strand (Patent No. 2,609,653). When used in conventional clamps:

- it extends uninterrupted conductor life
- it eliminates wear possibilities
- it prevents excessive mass and stress concentrations.

Tomorrow's answer is here today: the armor rod principle carried one step further in Preformed's ARMOR-GRIP SUSPENSION (Patent No. 2,722,393), the entirely new concept in suspension design.

The Armor-Grip Suspension Unit is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Rods which distribute their pressure over a relatively large area. The result: no wear possibilities—no mass concentrations—*and no clamping stress concentrations.*

This is another example of PLP research laboratories at work. Ever improving methods, materials and solutions is our goal. Call a PLP Representative today and ask for a demonstration.

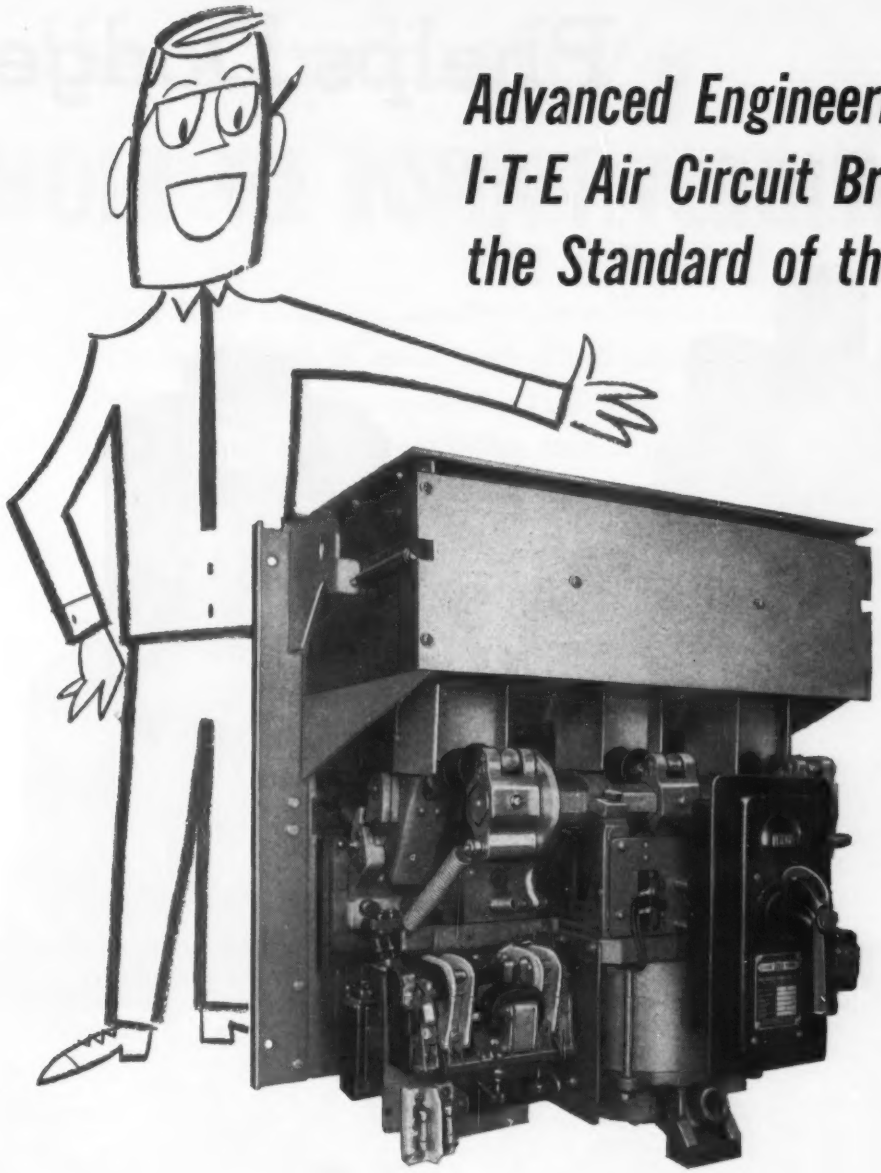
******John Dewey, "The Reconstruction of Philosophy"*

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PLP

PREFORMED LINE PRODUCTS COMPANY

6349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO



Advanced Engineering Makes I-T-E Air Circuit Breakers the Standard of the Industry

New design extends K line through 4000 amp continuous and 150,000 amp interrupting capacity

Here are some of the extra features that make the new K line of I-T-E circuit breakers the standard of the industry:

- Compact arc chutes designed to provide fast, efficient arc interruption
- Contact structure utilizing silver-alloy, wiping action, sturdy construction and blow-on arrangements to assure superior interrupting ability, and long life
- Dual magnetic overcurrent trip, dual selective overcurrent trip, and other auxiliary devices
- Standardized location of all tripping devices, solenoid relays, auxiliary switches and terminal blocks

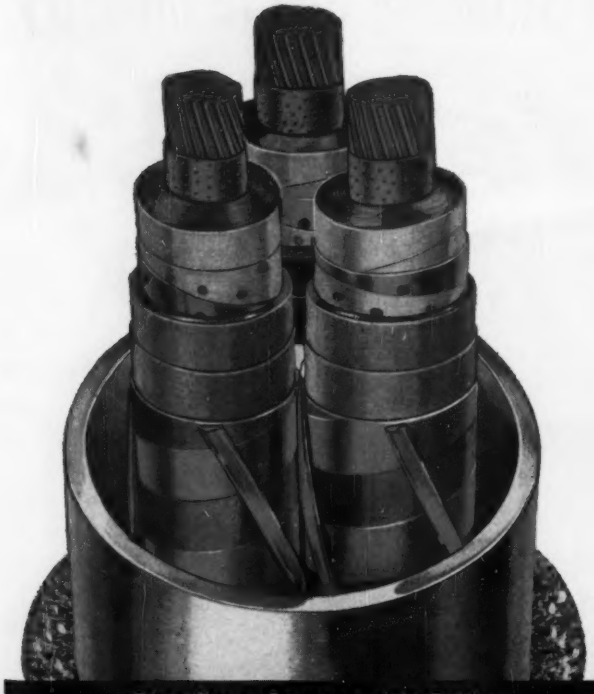
For the complete story of I-T-E superiority, contact your local I-T-E representative. Or write for Bulletin 6004B, I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.

I-T-E

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

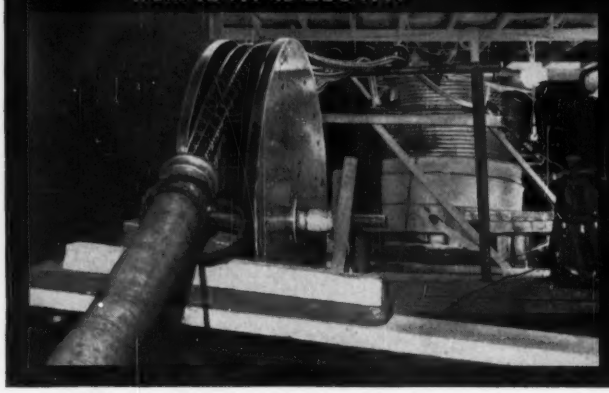
Phelps Dodge

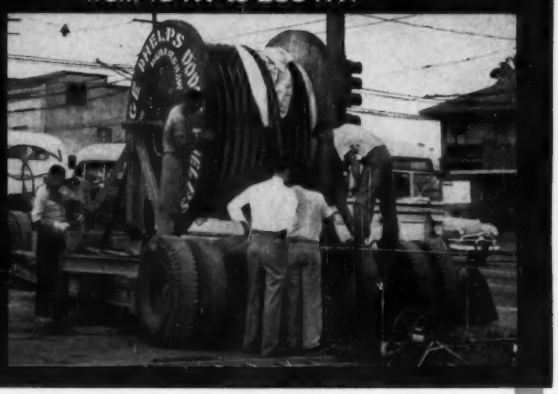
WIDEST RANGE OF HIGH



Pipe Type, Compression Cable,
from 15 KV to 230 KV.

Low Pressure, Oil-Filled Cable,
from 15 KV to 230 KV.

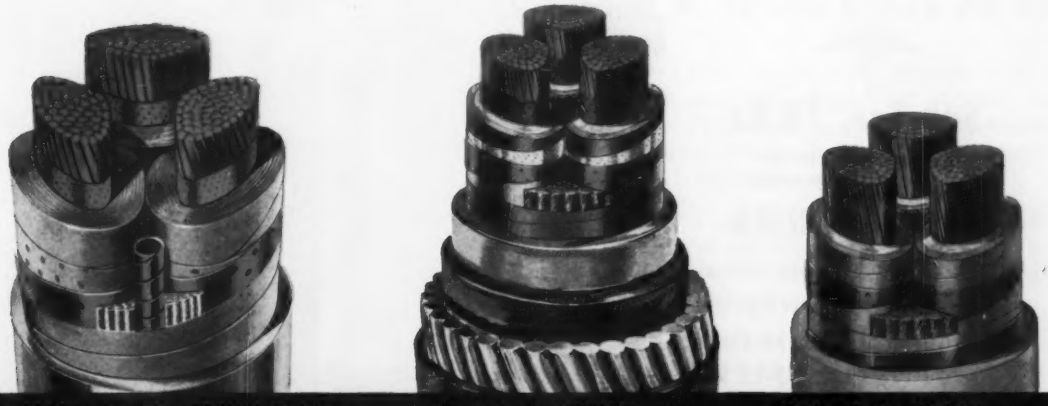




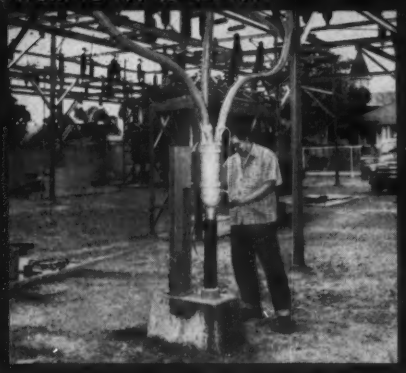
Consult Phelps Dodge for the correct answer
to your requirements, regardless of voltage or type!

offers Industry's VOLTAGE POWER CABLE!

Only Phelps Dodge has manufacturing experience and operational "know how" with the entire range of high voltage cables which includes: oil compression, gas compression, high pressure oil, high pressure gas, pipe type cables; medium pressure gas, low pressure oil-filled, low pressure gas, submarine and solid type cables.



Low Pressure, Gas-Filled Cable, from 15 KV to 44 KV.



Submarine Cable, from 15* KV to 35 KV.

Solid Type Cable, from 15* KV to 69 KV.

*Lower voltage cables in this class also available.

PHELPS DODGE COPPER PRODUCTS CORPORATION

300 PARK AVENUE, NEW YORK 22, N. Y.

HERE'S THE PRACTICAL SOLUTION TO AN IMPORTANT NETWORK TRANSFORMER MAINTENANCE PROBLEM:

Corrugated

500 Kva, 15 Kv

Grounding switch internally mounted

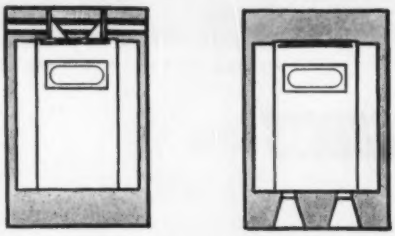
ONLY 50″ HIGH

Pennsylvania Network Transformers with Corrugated Cooling available in sizes 500-750-1000 kva. 5-15 kv.

Disconnect and grounding switch can be externally mounted.

CORRUGATED COOLED NETWORK TANK FEATURES

SUSPENSION MOUNTING OR **PEDESTAL MOUNTING**



CORRUGATED COOLING

for genuine ease of

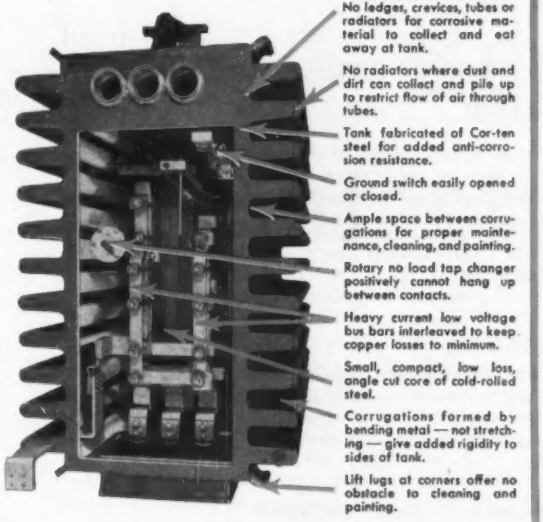
INSPECTION
CLEANING
PAINTING

Cooling*

IN PENNSYLVANIA'S NEW LOW-HEIGHT, SUBWAY-TYPE NETWORK TRANSFORMERS

In Pennsylvania's new subway-type network transformers, tank corrugations instead of conventional tubes and radiators provide the necessary radiating surfaces for proper cooling of the insulating liquid.

Tanks with smooth, vertical, corrugated surfaces have certain fundamental advantages for network transformers that are installed underground. They are easy to maintain properly in subway vaults where water, sludge, salt, and sewage are constantly eating and corroding away transformer cases and particularly transformer cooling tubes.


All tank surfaces are vertical. No ledges, crevices, tubes or radiators for corrosive material to collect and eat away at tank.
No radiators where dust and dirt can collect and pile up to restrict flow of air through tubes.
Tank fabricated of Cor-ten steel for added anti-corrosion resistance.
Ground switch easily opened or closed.
Ample space between corrugations for proper maintenance, cleaning, and painting.
Rotary no load tap changer positively cannot hang up between contacts.
Heavy current low voltage bus bars interleaved to keep copper losses to minimum.
Small, compact, low loss, angle cut core of cold-rolled steel.
Corrugations formed by bending metal — not stretching — give added rigidity to sides of tank.
Lift lugs at corners offer no obstacle to cleaning and painting.

* DESIGNED WITH YOUR MAINTENANCE PROBLEM IN MIND

The entire tank can be cleaned and even painted from a position above the transformer with complete assurance that the workman will be able to see and reach every bit of surface on the tank.

As a further measure of safety against corrosion, tanks, covers and bottoms are fabricated of Cor-Ten steel which has an inherent resistance to corrosion that is two to three times better than copper-bearing steel.

And there is more to this new transformer than Cor-Ten Corrugated Cooling. In the network transformer pictured here, where the grounding switch is mounted internally, the entire transformer, including the core and coils, was redesigned. It was reduced to two-thirds the size of the preceding model, which means it will fit into a small vault, or even replace a *smaller* Kva transformer in an existing vault. This particular model is only 50 inches high, and can be provided with brackets for suspension mounting, or pedestals for installation high above the floor of the vault.

If you are interested in learning more about these *really new* corrugated-cooled, subway-type network transformers, please contact Pennsylvania Transformer Company's Power Sales Department. Competent engineers will be happy to come to your office to discuss these transformers in complete detail.

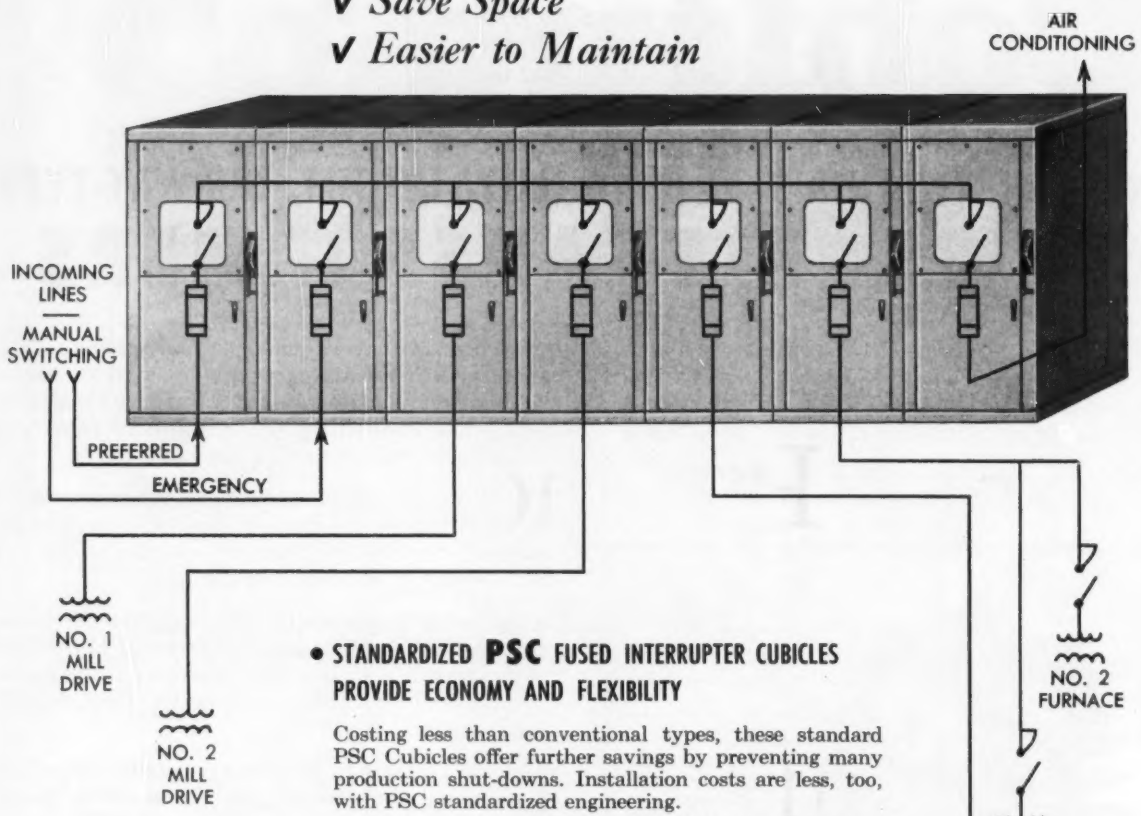
PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • **CANONSBURG, PA.** • *Greater Pittsburgh District*

R&IE

POWER SWITCHING CENTERS

✓ *Cost Less*
✓ *Save Space*
✓ *Easier to Maintain*



• **STANDARDIZED PSC FUSED INTERRUPTER CUBICLES PROVIDE ECONOMY AND FLEXIBILITY**

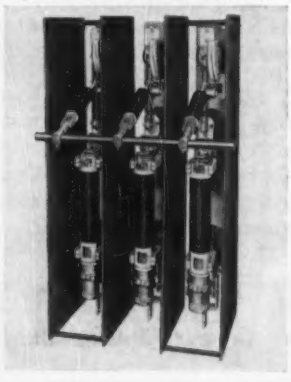
Costing less than conventional types, these standard PSC Cubicles offer further savings by preventing many production shut-downs. Installation costs are less, too, with PSC standardized engineering.

As much as 100 square feet of valuable floor space can be saved. PSC standard-dimensioned space economy means that you can accurately plan for area required. Also, you can readily add PSC Cubicles for additional feeders at any time, again with minimum space required.

So simple is the switching operation that any plant maintenance crew can inspect and keep the switches and power fuses in good condition. Metal enclosed and interlocked with doors and breakers—the interrupters conform with normal safety requirements.

• *Ask the R&IE Representative to show you these economies with PSC Cubicles*

Type HPL-C Switches in ratings of 4.8, 7.2/13.2 and 14.4 KV, 600 and 1200 amperes, indoor and outdoor.



R&IE

R&IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER CO.
GREENSBURG, PA.

We say this without reservation—will back it up with proof:

New Balanced Mobil D.T.E. Oils Can Improve Your Production And Reduce Manufacturing Costs

For years Mobil D.T.E. oils have set the standard of quality for all hydraulic and circulating oils. Recently they were dramatically improved—so much so that their margin of superiority is now greatly increased.

New Mobil D.T.E. oils are *balanced* to meet the widest range of operating conditions. They will give years of trouble-free service—even in continuous high temperature circulating systems. They will keep your machines free from deposits over the complete range of service. They will give you the highest degree of protection against wear... rust... corrosion. In fact, tests show *most machines will become obsolete before these oils need changing* when operating at normal temperatures.

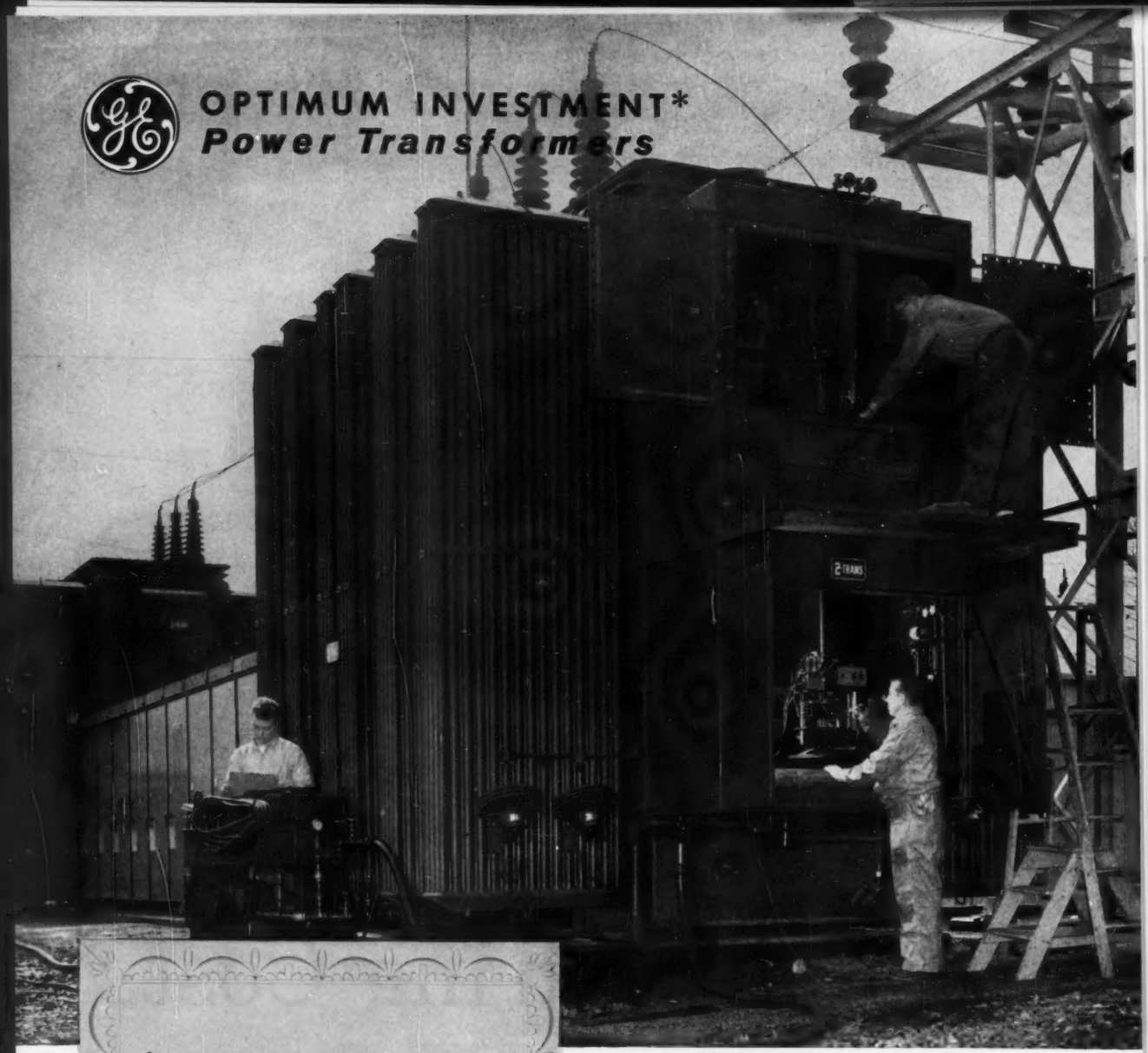
Let us show you concrete *proof* that new balanced Mobil D.T.E. oils can improve production and cut manufacturing costs. Ask your Mobil representative for the "balanced" story.

SOCONY MOBIL

FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

OPTIMUM INVESTMENT*
Power Transformers

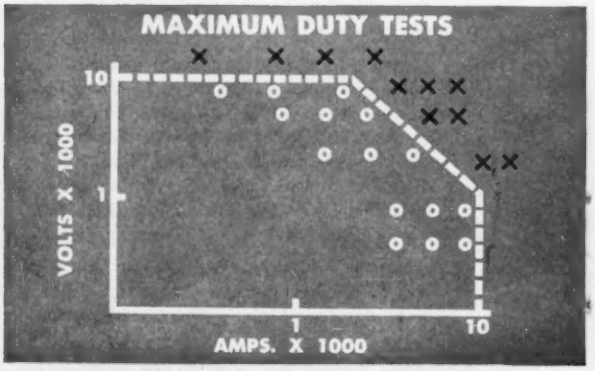


*Optimum Investment

Your assurance of lower long-term cost, plus greater dividends from your investment in General Electric large power transformers, through:

- **LOW ENGINEERING COST:** G-E field services reduce your engineering expense.
- **LOW PURCHASE COST:** Skill to produce optimum design for each application.
- **LOW INSTALLATION COST:** Upright shipment, one-piece tank speeds handling.
- **LOW OPERATING COST:** Permanent, better characteristics for lasting economy.
- **LOW MAINTENANCE COST:** Product improvements, greater reliability reduce outages.

G-E LTC EQUIPMENT now has 4 times the tip life of 1936 mechanisms. Maintenance, when needed, is simplified by hinged doors, roomy accessibility, and reusable Nitrile gaskets. Shown above is 15,000-kva, 69-kv unit.



SHORT-CIRCUIT DUTY is an important, extra feature of G-E LTC equipment. Each mechanism is thoroughly tested and applied only where test data (circles) proves ability to successfully operate under short-circuit conditions.

In the next five years . . .

Utilities will save $2,000,000 capitalized cost of reduced load-tap-changer maintenance

300% increase in LTC contact life in 20 years results from improved General Electric product features

Utilities have reported they spend an average of $200 each time they inspect and/or maintain LTC equipment. This is necessary about every three years. Yet today, General Electric load-tap-changers have an average of four times the tip life, for equal applications, compared to twenty years ago. On this basis and for the number of LTC equipments General Electric will ship in the next five years, assuming a 12% capitalization rate, electric utilities will save over $2,000,000 capitalized cost of LTC maintenance.

New and better design features developed by General Electric have made such savings possible. Heavier and thicker Arconite contact tips wear longer before replacement is necessary. Electrostatic shielding along panels and insulating rods breaks up creepage paths and eliminates the need for sporadic maintenance. Electrical and mechanical soundness is proven by the ability of mechanisms to complete a tap change even under short circuit—with no damage.

These and other G-E advances, such as those that reduce repaintings and prolong oil life, reduce your maintenance expense. And, combined with other features that give you low operating, purchase, engineering, and installation costs, they make your General Electric Power Transformer an *Optimum Investment.* General Electric Co., Schenectady 5, New York.

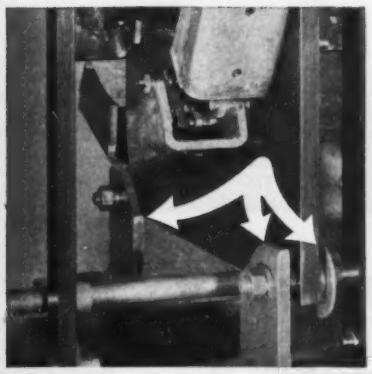
211-41

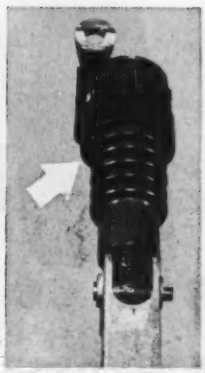
IMPROVEMENT OF LOAD-TAP-CHANGER PERFORMANCE

TYPICAL TRANSFORMER APPLICATIONS			EXPECTED TIP LIFE—Number of Operations	
KVA —MAX.	HIGH VOLTAGE —KV	RANGE —Per Cent	1936	1956
10,000	69 GR Y	±10	55,000	500,000
25,000	67 △	±10	70,000	140,000
55,000	115 GR Y	±10	30,000	160,000
92,000	110 GR Y	±10	40,000	65,000
166,700 (output)	230 GR Y	±7.5	24,000	50,000

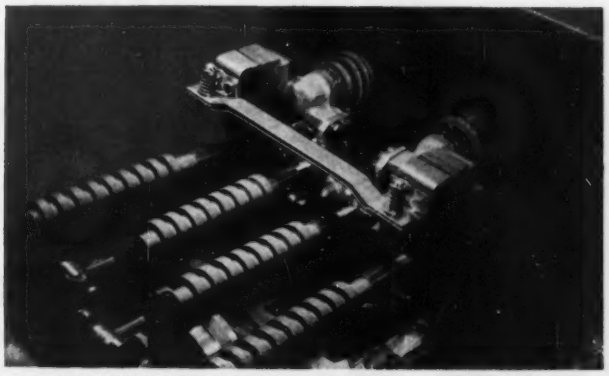
Progress Is Our Most Important Product

GENERAL ELECTRIC





ELECTROSTATIC SHIELDING by collars (right), washers and projected supports (left), reduces excessive maintenance cost by diverting "particle-attracting" electrostatic stress so creepage paths are not formed along insulation.

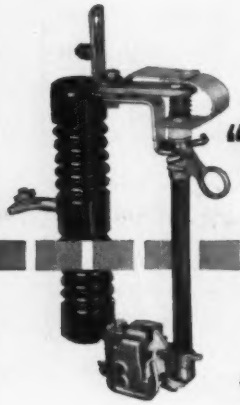


ARCONITE CONTACT TIPS last longer; life is further extended by controlling contact speed. Life of contacts, insulation, and mechanical parts; plus normal and short-circuit duty requirements, are completely co-ordinated for every application.

Now...clear 12000 amps

WITH AN OPEN CUTOUT

AT ONLY "EXTRA HEAVY DUTY" COST

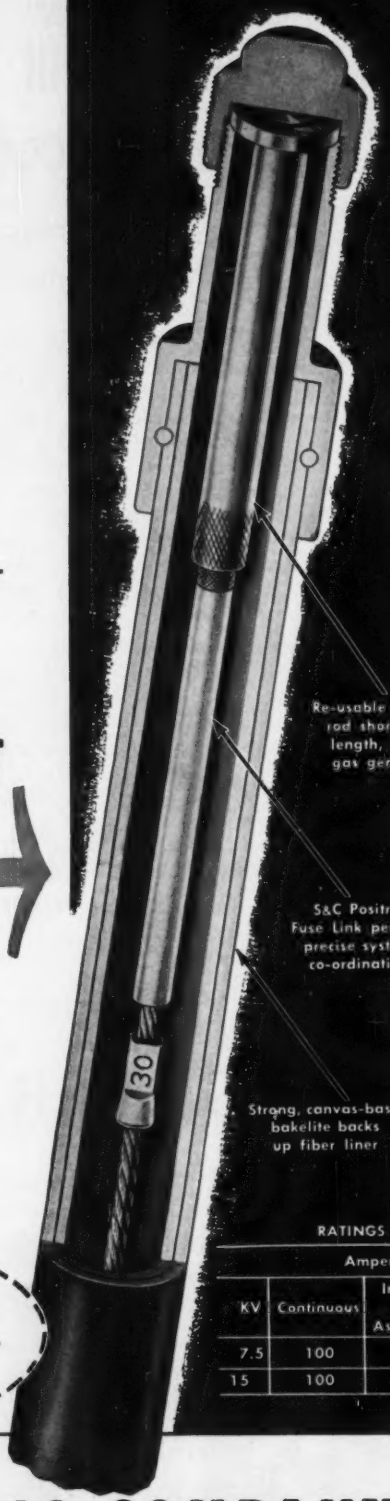


S&C's Open Cutout—Type XS—with a newly developed fuse tube—provides the higher interrupting capacity needed on some of your distribution feeders . . . without sacrificing linemen's safety . . . without double-venting . . . without resorting to an oversize bore . . . and without a cost premium.

This high interrupting capacity is achieved through two new developments which result in (a) minimizing the energy developed within the fuse tube and (b) absorbing this reduced energy in a unique recoil mechanism. Low fault interruption has not been sacrificed either. It is assured by a strong, fast-acting flipper.

Specialists in High-Voltage Circuit Interruption since 1910

Handles lightest faults, too!


Re-usable extension rod shortens arc length, reduces gas generation
S&C Positrol Fuse Link permits precise system co-ordination
Strong, canvas-base bakelite backs up fiber liner
130

RATINGS

KV	Amperes: Continuous	Amperes: Interrupting (RMS, Asymmetrical)
7.5	100	12000
15	100	10000

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

ELECTRICAL BUSINESS OUTLOOK

Electrical World
OCTOBER 29, 1956

Domestic copper prices are in for another cut. The present 40¢ a lb price maintained by domestic producers becomes more and more untenable as foreign prices keep dropping. In just a little over a week the spread between prices has increased 1½¢ to 6¢ a lb giving foreign competition a considerable price advantage over domestic copper and brass mills. It's a safe bet to assume that domestic producers will move shortly to ease the situation.

• • •

Shipments by machinery manufacturers will stay at a healthy level over the next three to six months. That's how much of a look-ahead you get from McGraw-Hill's newest business barometer—the index of new orders for industrial machinery. The index is a measure of monthly changes in new orders for all nonelectrical machinery and parts except hand tools, operating supplies, consumer items and farm equipment. It reflects dollar value of orders and is not adjusted for price changes.

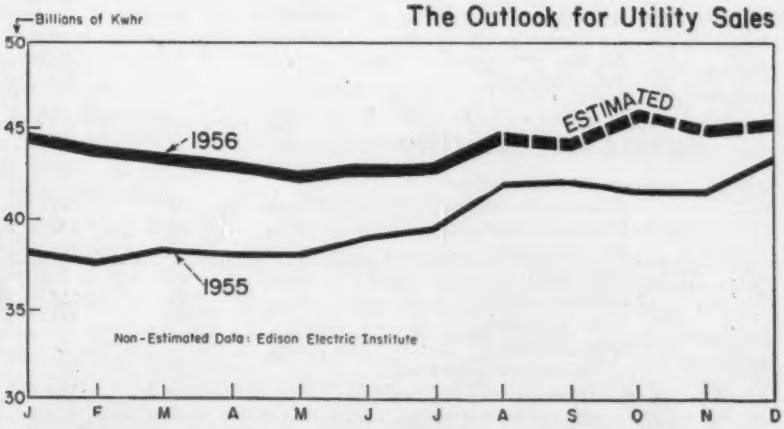
New orders in August were 14.5% higher than the same month last year when the unadjusted index was 124 (1950 average = 100). On a seasonably adjusted basis the index hit 156 in August — 14.7% higher than last year.

• • •

Residential energy sales are in for quite a boost from increased use of appliances over the next decade. That's the impression you get from Hotpoint Co's latest forecast of appliance sales from 1956 to 1966 (EW, Oct. 22, p 57). Here's a look at what's in store for some of the major load building items.

Custom electric ranges will chalk up one of the largest gains with a growth of almost 750% to a record 7.98 million units in use by 1966. Others will grow in this way: Automatic washers 86.3% to 28.5 million units, electric dryers 290.8% to 17.9 million units, water heaters 72.7% to 13.6 million units and room air conditioners 499% to 25.1 million units. Even household refrigerators will show a gain of 24.1% to 55.6 million units.

But even at this rapid rate of growth use of most appliances will be nowhere near saturation by 1966. Custom ranges will show only 13.9% saturation by '66, automatic washers 49.7%, dryers 31.2%, water heaters 23.8%, and air conditioners 30%. The answer here, of course, is that replacements will be a growing percentage of future appliance sales.



STATISTICS

Average Family Income Jumped 6% in 1955 (Families in Thousands)				
	1952	1953	1954	1955
Total U. S.				
Families	41,020	41,202	41,934	42,843
Average Income	$3,890	$4,233	$4,173	$4,421
Urban				
Families	26,786	26,959	27,530	27,612
Average Income	$4,249	$4,663	$4,591	$4,840
Rural Nonfarm				
Families	8,782	9,034	9,178	9,920
Average Income	$3,720	$3,951	$3,891	$4,328
Rural Farm				
Families	5,452	5,209	5,226	5,311
Average Income	$2,226	$2,131	$1,973	$2,111

Source: U. S. Dept. of Commerce, Bureau of Census

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	July	117.54	117.50	108.70	8.0
Peak—Class 1 Systems (million kw)	July	94.8	97.0	89.3	6.2
Estimated Dec. '56 Peak (million kw)	Aug.	106.10	106.09	103.83	2.2
Production—billion kwhr	July	49.45	49.45	46.63	6.0
Hydro		9.91	10.05	9.35	6.0
Fuel		39.54	39.40	37.40	5.7
Sales—billion kwhr	July	44.57	44.53	40.89	9.0
Residential		11.38	10.98	9.92	14.7
Commercial		7.74	7.28	6.91	12.0
Industrial		22.71	23.80	21.49	5.7
Other		2.73	2.48	2.57	6.2
Fuel Consumption	July				
Coal—million tons		12.00	12.34	11.74	2.2
Oil—million barrels		4.32	4.61	4.63	− 6.7
Gas—billion cu. ft		136.97	127.04	127.62	7.3
Net Income Class A & B Co's—$ million	Aug.	97.17	96.86	93.14	4.3
Residential Customers—millions	12 mos.	45.10	44.99	43.84	2.9
Revenue per kwhr	ended	2.61¢	2.62¢	2.66¢	− 1.9
Avg kwhr per customer	July 31	2,899	2,879	2,662	8.9
Avg annual bill		$75.66	$75.43	$70.81	6.8

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Sept.	145	142	142	2.1
ENR Construction Cost	Oct.	147.6	147.8	141.3	4.5
BLS Cost-of-living	Aug.	116.8	117.0	114.5	2.0
NEMA Sales					
Insulation materials	Aug.	153	117	147	4.1
Electric appliances		100	111	101	− 1.0
Wholesale prices	Aug.				
Motors and generators		133.3	133.1	121.8	9.4
Transformers and regulators		139.7	134.5	127.3	9.7
Switchgear and fuses		153.8	152.6	139.2	10.5
GNP—annual rate—$ billion	2nd Qtr.	408.3	403.4	387.4	5.4

Your Business

A warning for the teacher. School teachers who insist on doing their own house wiring got this notice from the chief education officer in Kent, England: "It cannot be too strongly emphasized that the standard mains voltage can be lethal. Portable equipment must be connected to suitable plugs, and not light sockets, by a single length of cable without joints."

"Bugs" in Britain. Commenting on our recent article on appliance repair and servicing (EW, June 18, p 46). The British Electrical Review says. "The subject is studied in a recent article in the Electrical World from which I gather that the problems (or "bugs" as the author calls them) are much the same there as here."

Air conditioning everywhere. Seems a brand new market opens for the electric air conditioning industry every month. No sooner had it worked out techniques for taking some of the heat off New York's sweltering subway riders than it got an order from relatively cool Alaska. The Alaskans weren't interested in lower temperatures but wanted to use the units to circulate and dehumidify the air.

"You say our autotransformer is interfering with your television reception?"

Ben looks ahead. Back in 1780, Franklin wrote: "The rapid progress true science now makes occasions my regretting sometimes that I was born so soon. It is impossible to imagine the height to which may be carried, in a thousand years, the power of man over matter." He saw even then that "Agriculture may diminish its labour and double its produce" as it has through the use of mechanization.

Reading saves time. You don't have time **not** to read.

Your Health — Kidney Disease

REX H. WILSON, MD, Medical Director, B. F. Goodrich Co

This 45-year-old man suddenly began to have swelling of his legs, abdomen and face. His physician sent him to the hospital for treatment.

The most outstanding laboratory finding was the presence of albumin and blood in his urine. The diagnosis of acute glomerular nephritis, a sudden, diffuse inflammation of the kidneys, was made.

His history revealed that he had had a severe ringworm infection (athlete's foot) in the right foot, which had flared up, with red streaks developing in his leg, and pain in his groin. Undoubtedly the ring-worm infection had become re-infected with a bacteria called streptococcus, which had caused an inflammatory reaction in his kidneys.

Treatment with the antibiotics, prolonged rest, a carefully planned diet, salt restriction and the judicious use of liquids eventually resulted in the disappearance of all of the signs and symptoms. He might have developed a chronic nephritis which could have made him a partial invalid.

Infections can cause trouble in other places in the body than just at the site of the infection. Inflammatory reactions of the kidneys are relatively common. Exposure to some toxic chemicals may result in nephritis.

When certain bacteria get into the system they may irritate and inflame the kidney tissue. Tiredness, headache and fever occur. Swelling appears in the face, abdomen and legs. The urine may be decreased in amount, is smoky or reddish in color and contains much albumin, red blood cells, casts and pus cells. An analysis of the blood reveals a retention of waste products due to poor kidney function. If this condition persists, uremia develops. The blood pressure usually rises. The heart may be affected.

The average case lasts for a few weeks. Most patients recover. In some, however, the blood pressure continues to rise, the urine findings become more marked and signs of kidney failure occur. This is a serious condition.

Everyone will, from time to time, have various kinds of acute infections. Consult your physician if they do not clear up. One of the complications which you might develop from an apparently insignificant infection is nephritis.

WASHINGTON COMMENT

Chudoff, Byrd to Probe Fast Tax Write-Offs

V. CRAIG RICHTER, Washington Correspondent

Congressional investigations of the electric utility industry may not be comparable in all respects to soap operas. But they do have one thing in common: inevitability. There's always another episode.

The Congressman who claims privy to this field can look forward to full employment, if not for himself, then for the staff that justifies his budget appropriation.

Rep Earl Chudoff (D-Pa.), chairman of the House public works and resources subcommittee, has staked his claim to this fertile field. With a number of hearings now behind him he is looking to 1957, apparently certain of re-election, to go after the utilities again. The subject: fast tax amortization certificates for electric companies.

Set to Badger Electric Companies

Both the subject matter and the timing of the proposed hearings (scheduled for early in the new year) indicate that they can have only one objective. This is political capital at the expense of the utilities.

The World War II born accelerated amortization program was revived in 1950 by the Truman Administration. Its main purpose was to expand private industry's productive capacity to meet mobilization goals. It covered a wide range of defense essential industries. Electric power production is basic to all of these and thus was included.

A logical question arising from this is what can be achieved by singling out the electric production phase of this program? Furthermore, the electric production goal, calling for total capacity of 150 million kw by the end of 1958, was closed on December 31, 1955. The Office of Defense Mobilization has given no indication of any intention to review or re-open this 150-million-kw capacity goal.

As the position stands today, the fast amortization program for utilities calls for installation of about 75 million kw from 1951 to 1958. About 40 million kw of this is covered by amortization certificates.

Byrd Also to Take a Look

In contrast to Chudoff's investigation which makes no claim new legislation is its objective, Sen Harry F. Byrd (D-Va.), assuming he retains his chairmanship next year of the Senate Finance Committee, plans a look at the overall tax amortization program without emphasis in any one industry.

Byrd, a fiscal conservative, has definite legislative changes in mind. Related to Byrd's intentions are those of Rep Wilbur Mills (D-Ark.), chairman of a subcommittee of the tax-writing House Ways and Means committee. He plans to review the depreciation provisions of the 1954 Revenue Code.

Any proposals Byrd might come up with to cancel fast tax amortization could, assuming the present status quo, draw the support of Treasury Secretary George M. Humphrey. Humphrey has long felt the fast tax amortization program should be ended.

Public power exponents have sought to attack tax amortization by way of answering charges that public power is subsidized in one form or another. They have characterized tax amortization benefits as, in effect, interest-free loans to electric utilities. Chudoff will start from that premise, and he will go as long and as far as he can.

TECHNICAL NOTES

Tank storage of high level atomic wastes costs $2 to $7 per gal. Burial ranges from $0.14 to $2 and sea burial about $10 per cu ft.

Inspection and testing of 5,511 street lights by one utility disclosed 570 major defects, including 32 energized mast arms. Insulation failure accounted for 21 of the hot arms; open leads, six.

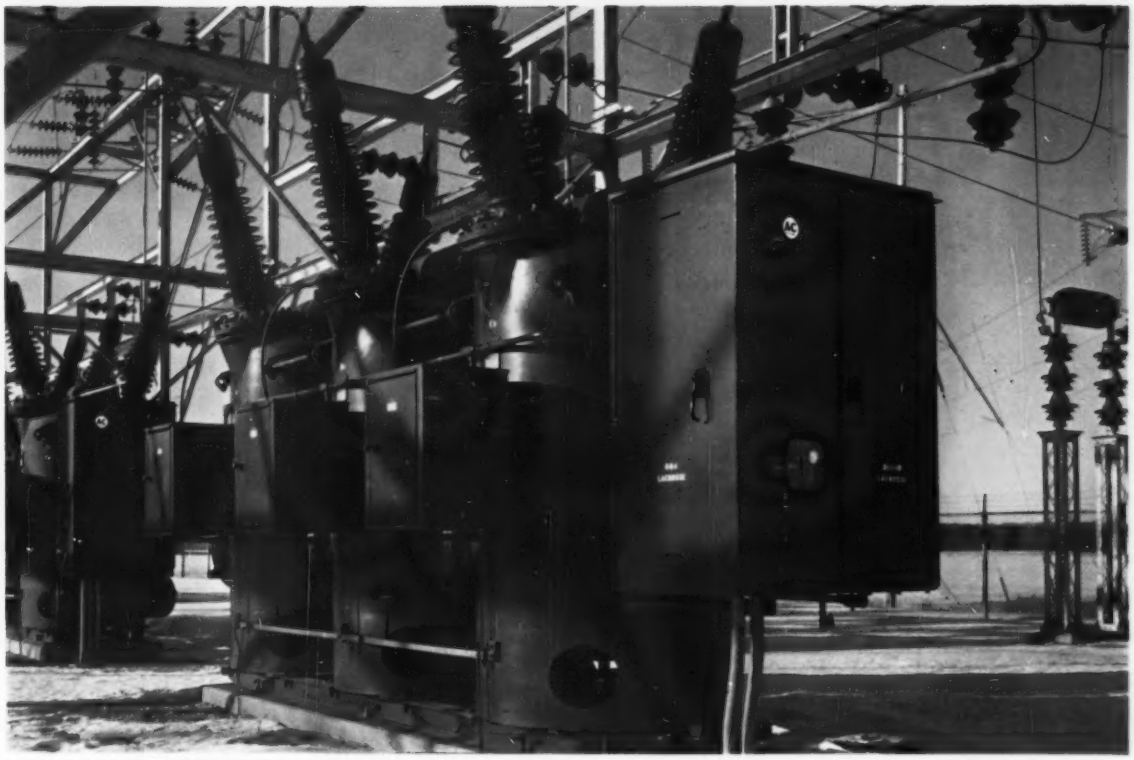
High boiler availability for a large unit is necessary because outage time and system reserve capacity to back up an idle unit are costly.

Inherent need for absolute minimum water makeup with supercritical-pressure steam cycles points to air as the cleaning medium for soot blowers.

Breaks in British rural lines are bypassed during repair with polyethylene-insulated cable laid on the ground.

Electric motors for soot blower drives have these advantages over air motors: higher overload-torque, lower maintenance, cleaner and more stable operation. But air motors cost less and take less space.

You Get MORE Positive Protection with Allis-Chalmers Breakers



This 115-kv Allis-Chalmers breaker with Mechanically Trip-Free *Pneu-Draulic* operator is installed in a substation of a large Midwest utility.

All Allis-Chalmers Breakers Are Mechanically Trip-Free

● Contacts open at full speed under *all* conditions *on every Allis-Chalmers breaker.* Simple uncoupling linkage permits contacts to open at full speed regardless of the position of the closing mechanism. *Pneumatically or hydraulically trip-free breakers cannot give you this protection.* This principle of breaker operation has been a feature of Allis-Chalmers breakers since 1933.

For details of this and other features, such as the *Pneu-Draulic* operator and the completely tested *Turbo Jet* interrupter, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic and *Turbo Jet* are Allis-Chalmers trademarks.

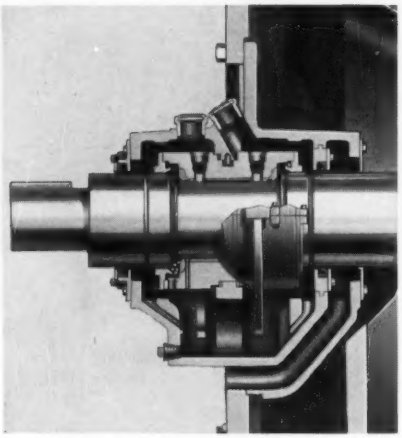
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

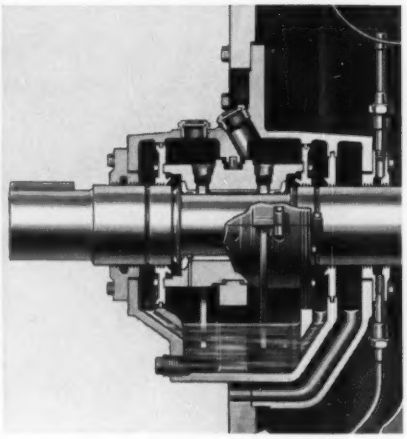
A-4980

NEW Bearing Design Means Better Motor Performance

Allis-Chalmers capsule-type sleeve bearings now perfected for complete motor line



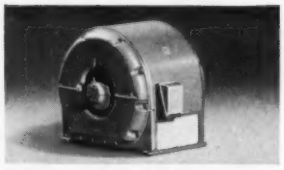
Standard capsule-type sleeve bearing



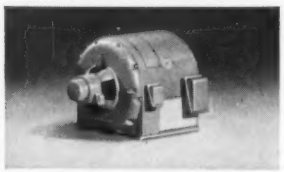
High speed capsule-type sleeve bearing

A new feature—an improved capsule-type bearing design—has been added to the Allis-Chalmers complete line of large end-shield bearing motors. This new bearing will give you better motor service, simplified maintenance and longer motor life through features like:

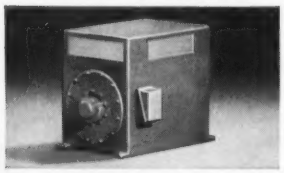
- Dust-tight, leakproof enclosure protects bearing from dirt, dust or abrasive materials.
- Venting system prevents oil leakage — keeps oil and vapor from getting into motor enclosure.
- Dual oil-rings insure bearing surface lubrication — either ring can adequately lubricate bearing.
- Split end-shield gives easy accessibility to winding and air gap — without disturbing capsule or bearing alignment.



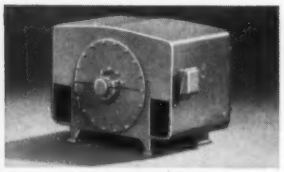
Drip-proof or splash-proof cage motor



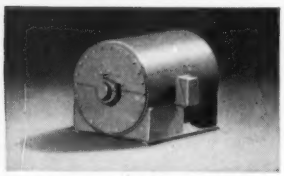
Synchronous or wound-rotor motor



High speed cage motor

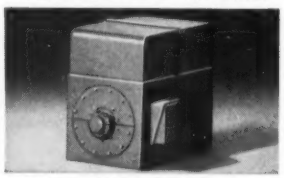


Weather-protected motor



Totally-enclosed fan-cooled motor

Totally-enclosed forced-ventilated motor



Water-cooled or inert-gas-filled motor

Capsule-type bearings are standard on these Allis-Chalmers motors.

You get **MORE** from Allis-Chalmers motors

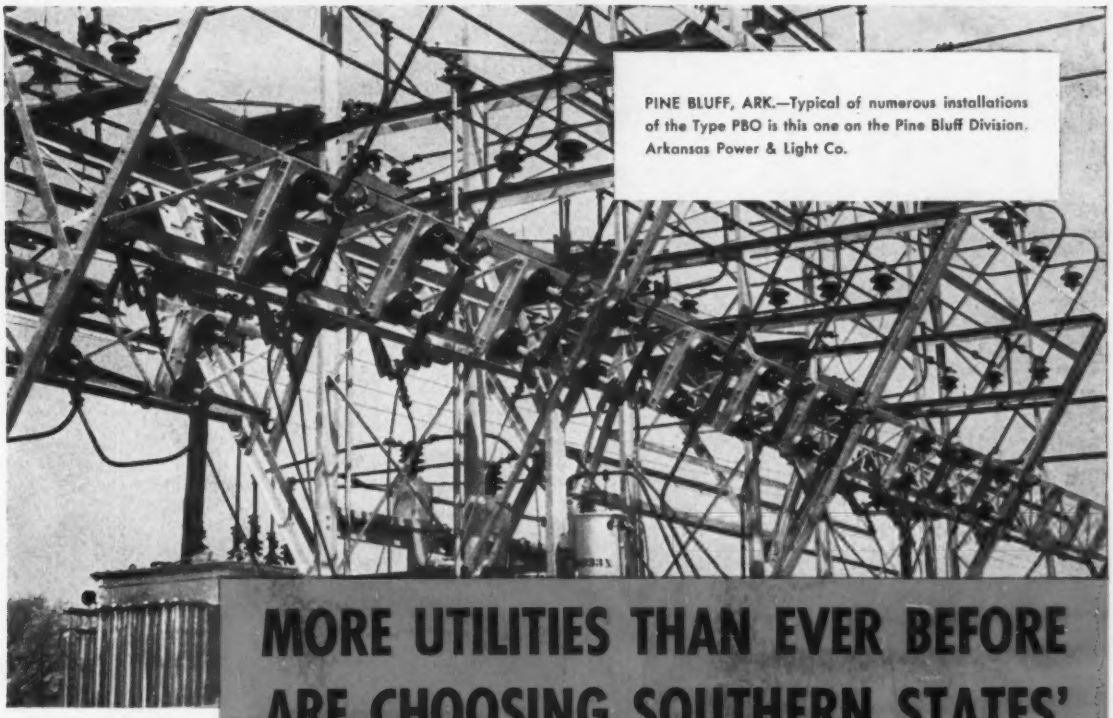
More design and construction features — more application help. For complete information, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

LIVE BETTER ELECTRICALLY

ALLIS-CHALMERS

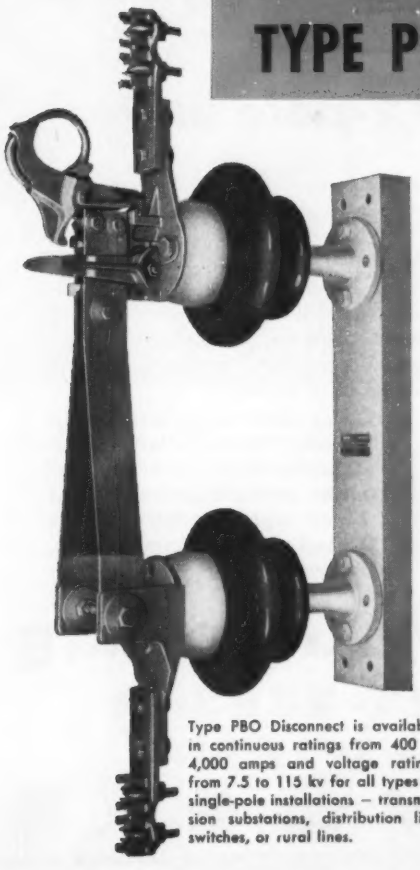
A-C ALLIS-CHALMERS

A-5032



PINE BLUFF, ARK.—Typical of numerous installations of the Type PBO is this one on the Pine Bluff Division, Arkansas Power & Light Co.

MORE UTILITIES THAN EVER BEFORE ARE CHOOSING SOUTHERN STATES' TYPE PBO DISCONNECT SWITCHES



Type PBO Disconnect is available in continuous ratings from 400 to 4,000 amps and voltage ratings from 7.5 to 115 kv for all types of single-pole installations — transmission substations, distribution line switches, or rural lines.

The growing popularity of the Type PBO Disconnect, for substation and distribution line switching, can be attributed to the preference of utility engineers for these outstanding features:

HIGH PRESSURE double-line contacts. Positive contact assured by wiping action of accurately machined surfaces. Hard drawn copper bus bar blades: double blade construction. 90° open blade stop unless otherwise specified.

EXTRA LARGE OPERATING RING of heavy duty construction.

POSITIVE LATCHING of blade in the closed position prevents opening under fault currents or from vibration.

BLADE PRY-OUT applies a powerful mechanical force to open the blade even under heavy coatings of ice.

CAST BLADE GUIDES are rigid and wide-flaring to position the contacts properly on each closing operation.

STEEL BASES, hot-dipped galvanized after fabrication, are available to specification.

Full details are contained in our Bulletin 55 PBO, a copy of which will be mailed gladly upon request.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

"Hearing is believing"

...listen to a really quiet 2-pole motor!

No longer must large 2-pole induction motors be considered the noisy nuisances of the electric motor family. The new *"super-quiet"* Elliott 2-pole design creates a *quality* and *level* of sound that will offend neither operators nor neighbors.

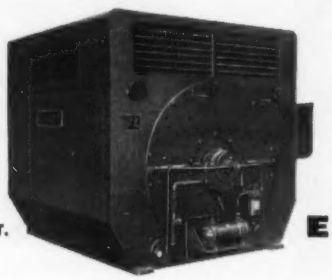
The Consulting Engineers and Utility Executives who watched and listened to an experimental 2000-hp "super-quiet" motor agreed, without exception, that they were hearing the quietest 2-pole motor of its size yet developed.

This solution to the problem of excessive noise was developed by Elliott after many years of trial and test. The answer was found in details of rotor and stator design – electrical, magnetic, and mechanical.

These design details combine to reduce objectionable *high-pitch* noise at its source. And the ingenuity of the ventilating system helps to baffle and absorb the internal noises, containing them within the motor.

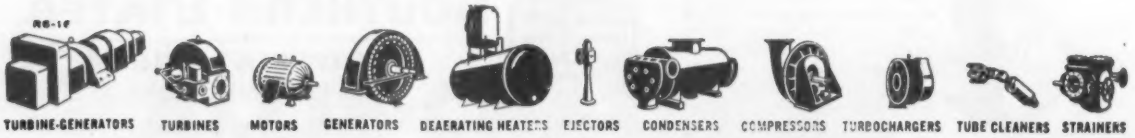
The latest design of the Elliott "super-quiet" motor, shown below, differs somewhat from the expetimental version above, achieving the same result in a neater, more attractive package. Note the filtered air inlets in the sides of the motor enclosure.

To all interested engineers we say, sincerely, "Hearing is believing." A demonstration of the "super-quiet" motor can be arranged through your Elliott representative. Or write Elliott Company, Ridgway Division, Ridgway, Pa.



Latest design 2500-hp "super-quiet" motor.

ELLIOTT Company



ANOTHER REASON WHY UTILITIES EXPECT MORE FROM

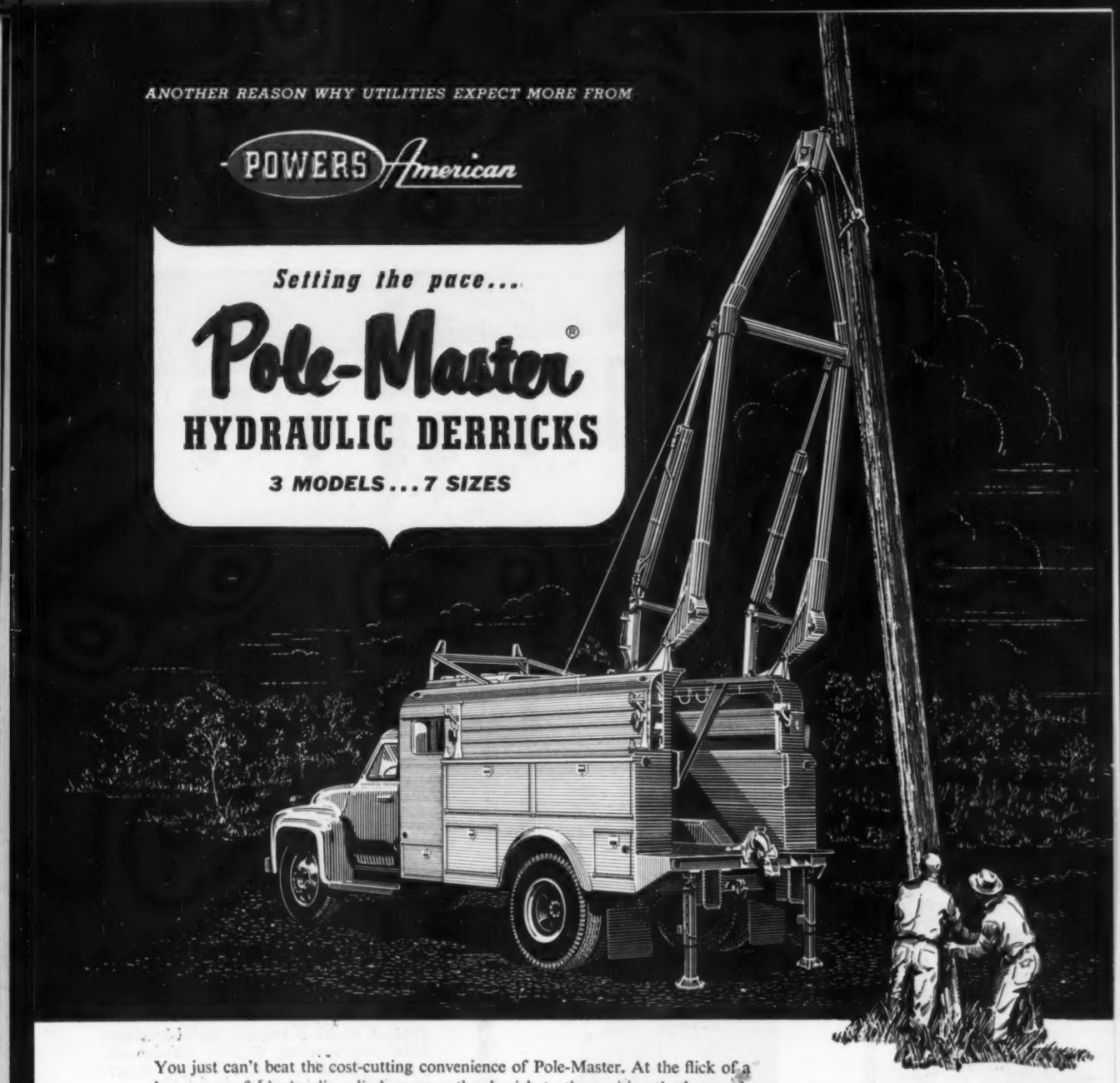
POWERS *American*

Setting the pace....

Pole-Master®

HYDRAULIC DERRICKS

3 MODELS... 7 SIZES



You just can't beat the cost-cutting convenience of Pole-Master. At the flick of a lever, powerful hydraulic cylinders move the derrick to the position that's *exactly* right for the hoisting job. There's no exposed mechanism. Head sheave can be threaded from the ground.

When it comes to capacity, Pole-Master equals or surpasses conventional derricks of comparable rating. It stows *above* the body... never obstructs valuable cargo area space.

Aren't these the features you've long wanted in a derrick for your job?

The powerful Series PM-2 Pole-Master, shown above on a Powers-American Series 800-C Line Body, is available in sizes for handling 40′, 55′, and 70′ poles.

DESCRIPTIVE LITERATURE ...plus complete price information IS YOURS FOR THE ASKING!

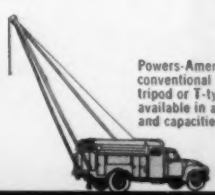
McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO.

625 CEDAR ST. • BERKELEY 10, CALIF.

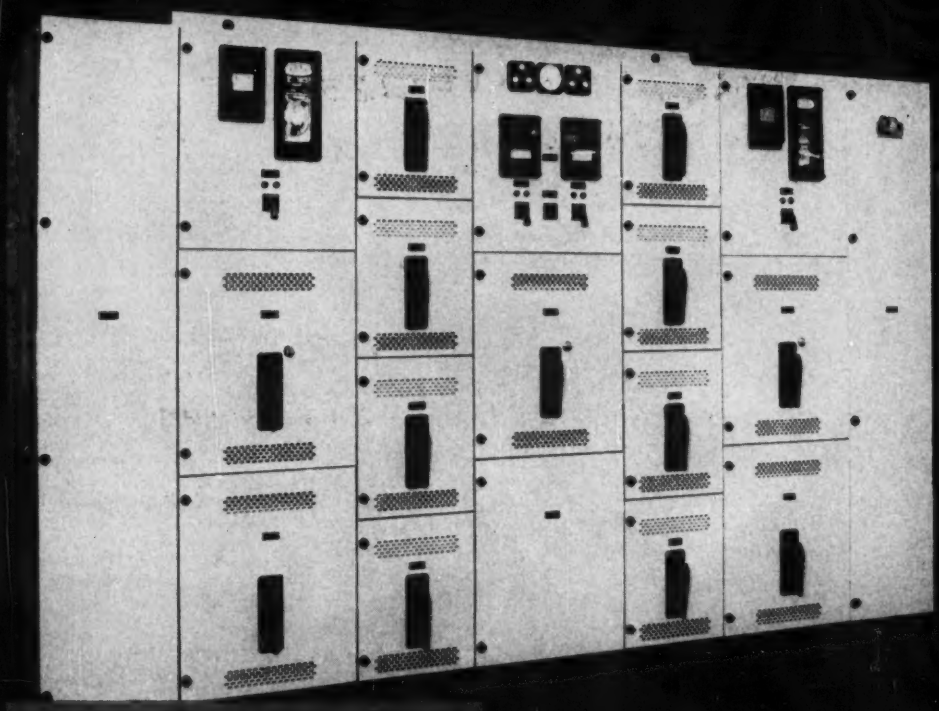
Series HD-2 Pole-Master Derricks can be furnished in sizes for handling 40′ and 55′ poles.

The Series HD-4 Pole-Master, actuated by four hydraulic cylinders, handles 55′ and 70′ poles.

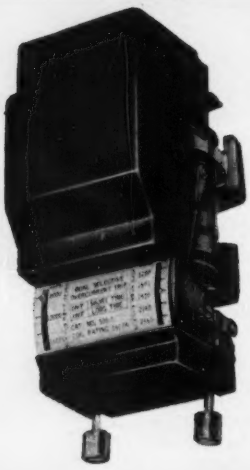


Powers-American conventional derricks, tripod or T-type, are available in all sizes and capacities.

ONLY FEDERAL PACIFIC COMBINES ALL THESE



FPE
FEDERAL PACIFIC ELECTRIC



4-HIGH CONSTRUCTION

Typical Federal Pacific Metal-Enclosed Switchgear assembly showing modular construction ranging from full-height instrument section to 4-high breaker section.

DUAL MAGNETIC OVERCURRENT TRIPPING DEVICE

Escapement-type mechanism provides accurately timed delay. Magnetic spring restrained instantaneous action for short circuits. Fast reset. Extremely accurate over permissible temperature ranges.

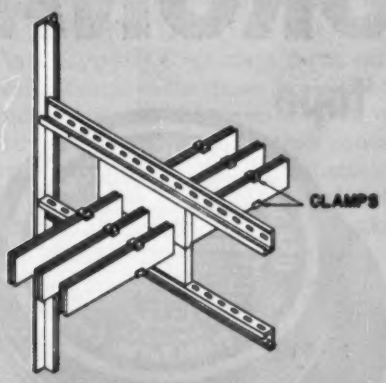
Finest Products Engineered

METAL-ENCLOSED SWITCHGEAR FEATURES!

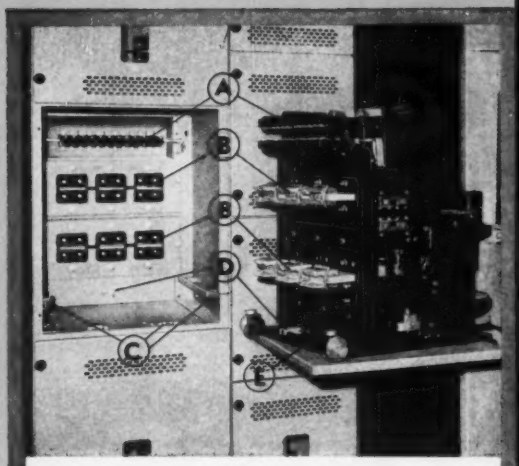
PROVIDES COMPLETE SAFETY... EASE OF MAINTENANCE... LOWEST INSTALLED COST!

Engineered for maximum flexibility and rugged, dependable performance...Federal Pacific low-voltage DMB metal-enclosed Switchgear is designed to give you the maximum engineered job with the minimum time. The secret: Modular construction! Ten-basic units, each of which has been thoroughly tested and proved in both laboratory and field installations ...can be used in various combinations to meet virtually every Switchgear requirement quickly...economically ...dependably.

What's more—delivery time and installation are drastically reduced when modular Metal-enclosed Switchgear is specified. Most of the engineering is already done. Assembly is standardized. Basic sections are always in stock.



STURDY BUS BAR SUPPORTS
Standard bus supports designed to permit mounting 3-phase busses with one, two or three bars per phase, providing a maximum current-capacity of 4000 amperes...withstands high fault currents within breaker ratings.



POSITIVE CONTACT ASSURED

A—SECONDARY DISCONNECTING CONTACTS. Stationary slide contact establishes control circuit in "test" and "operate" positions.

B—INDIVIDUALLY SPRING-LOADED FINGER-TYPE CONTACTS are mounted on breaker terminals for ease of inspection and maintenance. Specially designed clip contact arrangement provides wiping action not only on the stationary cell contacts but also on breaker terminals. Primary and secondary contacts heavily silver plated.

C—THREE POINT BREAKER POSITIONING insures positive contact alignment. Breaker is accurately guided by 2 cell-guide rails and a roller guide at the front of cell. All guide surfaces are cadmium plated to give lasting protective finish and smooth rolling action.

D—GROUND STAB engages contact on removable breaker in "test" and "operating" positions.

E—DRAWOUT BASE ASSEMBLY with guide wheels. These guide wheels in conjunction with a roller located near the front of the base plate simplify handling a breaker outside its cell.

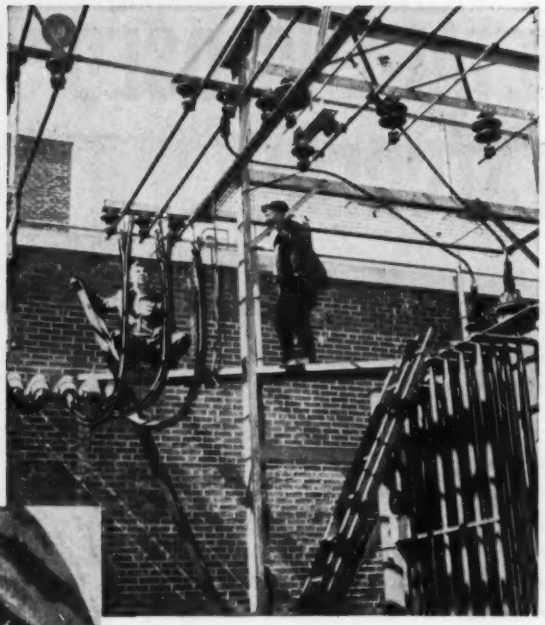
Complete range of Federal Pacific protective equipment from 110 volts through 330,000 volts!

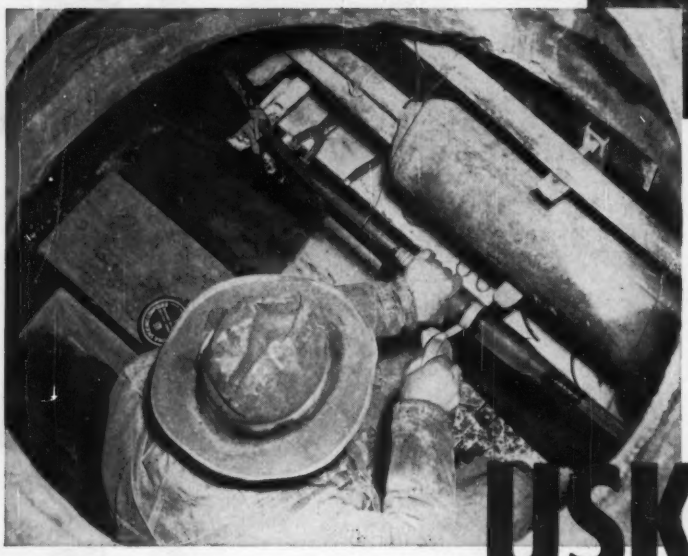
FPE
FEDERAL PACIFIC ELECTRIC

FEDERAL PACIFIC ELECTRIC COMPANY

50 Paris Street, Newark 1, N. J.

Overhead or Underground





There's never a breakdown with USKORONA tape

On splicing or terminating electrical cables on underground power lines, street lighting circuits and transformer leads, on secondary network systems—to name just a few—Uskorona tape is *essential* because it is the only tape that is resistant to both ozone and moisture. It fuses with and becomes a part of the insulation and gives the same dielectric strength as the original insulation. Naturally, it exceeds A.S.T.M. specifications.

Uskorona® was developed to assure ozone and moisture protection to high voltage lines. Here's how good Uskorona is:

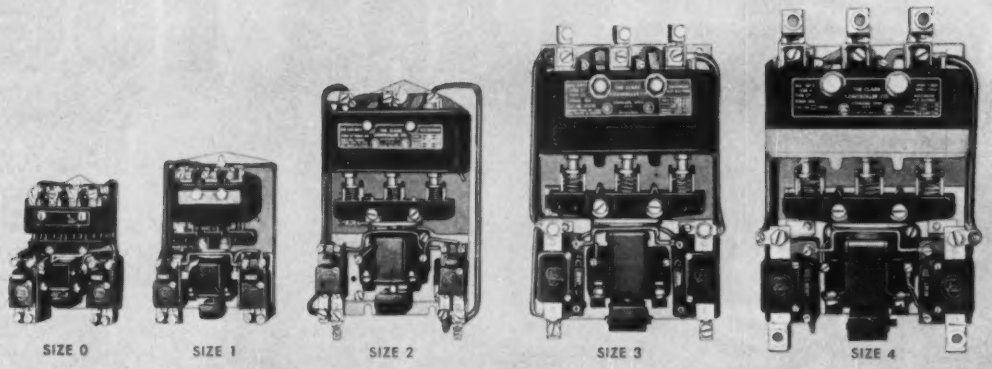
- In a corona-(ozone) resistance test of 4 leading brands, Uskorona was the only tape still intact after 4 hours of exposure.
- Even after 1500 additional hours of continuous exposure, Uskorona remained as fresh and corona-resistant as at the start.

Obtainable at any of our numerous distributors, any of the 28 "U. S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

Watch NCAA football, Saturday afternoon, NBC-TV

Mechanical Goods Division

United States Rubber

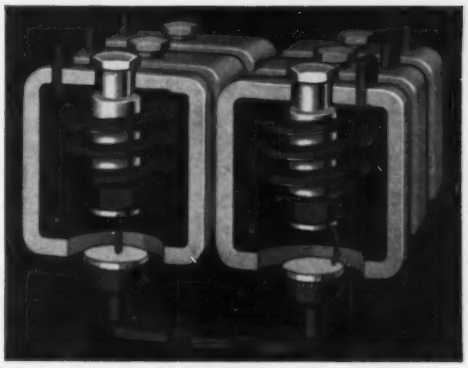


CLARK Type "CY" Starters now available in sizes

0 to 4

With the addition of the new size 4, the famous CLARK line of Type "CY" Magnetic Motor Starters now comprises the full range from 0 to 4. This means that Clark starters of the proven "CY" design incorporating vertical lift magnets are now available for more than 95% of industry's AC requirements. For installations requiring sizes 5 and larger, Clark will continue to supply dependable clapper-type starters.

Clark Type "CY" starters have many outstanding design features for more dependable operation, less maintenance and longer life. For example—rugged construction with twin-break contacts means more trouble-free service . . . contacts can be inspected without tools . . . movable and stationary contacts can be removed and replaced quickly, coils changed and the entire magnet assembly removed—all from the front—without special tools and without removing the starter from the cabinet or panel.



Revolutionary arc-quenching principle is an exclusive feature of all Clark Type "CY" starters sizes 2 and larger. It combines twin-break contacts with strong multi-turn magnetic blowouts which force the arc to rotate—alternately lengthened and confined—so that it moves continuously from a hot to a cold spot on the contact surfaces. This practically eliminates metal build-up or pitting and greatly increases contact life.

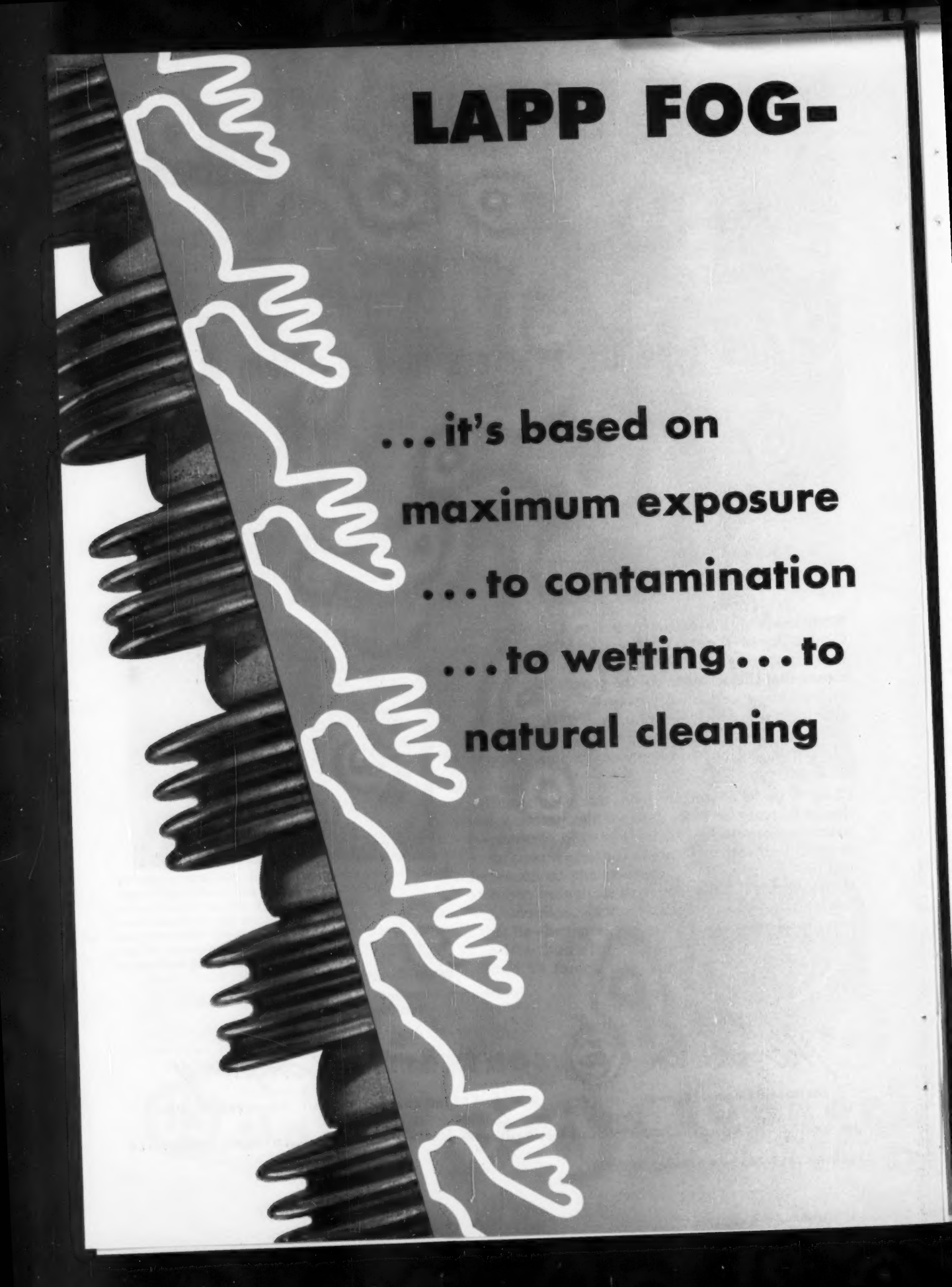
For complete information contact your nearest Clark sales office or write us direct.

The CLARK CONTROLLER Company

Engineered Electrical Control

1146 East 152nd Street • • Cleveland 10, Ohio

IN CANADA: CANADIAN CONTROLLERS, LIMITED • MAIN OFFICES AND PLANT, TORONTO


LAPP FOG-
...it's based on
maximum exposure
...to contamination
...to wetting...to
natural cleaning

TYPE DESIGN

Nobody wants power arcovers. They cause service interruptions, set fire to equipment, add to maintenance costs, and pull line crews out of bed on foul nights.

But power lines do have to run through areas where dust, salt-spray, chemicals—even automotive exhaust fumes—combine with fog or rain to coat insulators with a conductive material such that leakage flashover can occur unless special steps are taken to avoid it.

The "special steps" begin, usually, with increasing the length of leakage path. The distinguishing characteristic of every "fog type" design is the extra inches of leakage distance it provides.

Dozens (maybe hundreds) of insulator designs have been produced for operation under contaminated atmospheric conditions. All have had extra leakage distance, but few have merited a second order by a user. So it must be that the geometry of the increased leakage surface has something to do with its effectiveness.

There is one design that has been successful. It has a record of more than thirty years on this job and has generally been adopted for all types of porcelain insulators for outdoor service.

This is a brief story of the technical considerations back of this design and of the reasons why it can save you money by reducing insulator cleaning, avoiding outages, and providing more dependable operation than is possible with any other type of insulator.

The effect of any contaminant, spread over all or part of an insulator surface, is to lower the surface resistance, thus allowing more leakage current to flow.

It is here that most errors occur in the thinking about contamination problems. Most people, at first thought, consider leakage current bad—that it should be prevented from flowing. As a matter of fact, however, it is the leakage current that saves the insulator, because it is continually drying and correcting the low resistance which fog or drizzle has caused.

Variations in thickness, width of path, and wetness in various areas of the surface result in non-uniform leakage surfaces. These variations are caused by the cleaning action of wind and rain, by non-uniformity in width of surface, by shielding parts of the surface from rain. When rain falls on a dirty insulator, resistance of the wet part is lowered. Since the total resistance is reduced, more current flows, but this current dries the shielded high-resistance areas even more rapidly. Thus voltage piles up over these high-resistance sections, showing increasing fire and arcing, precipitating flashover.

It's the dry, high-resistance areas of insulator surface that start flashover, and any attempt to shield insulators, or parts of them, is to invite flashovers by creating "hot spots" which initiate the flashovers.

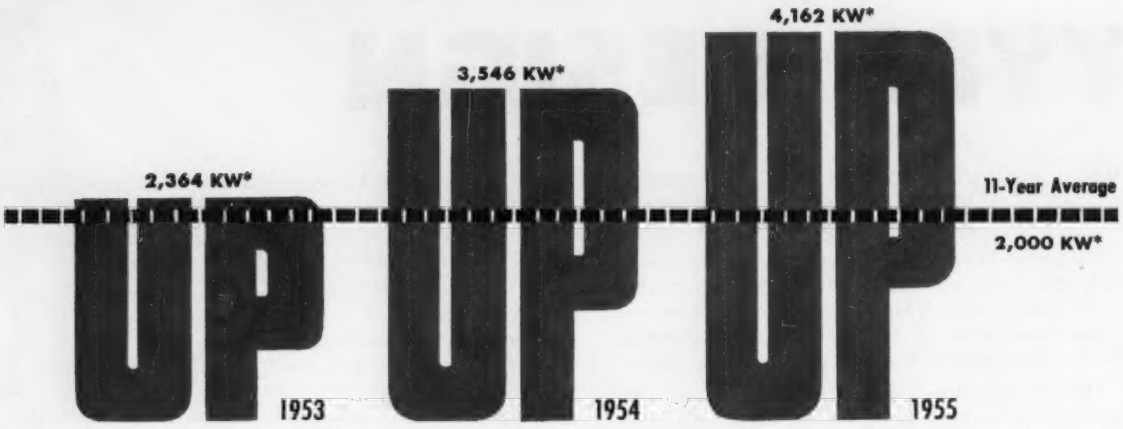
The Lapp principle of Fog-Type design seeks uniformity and tries to obtain this uniformity by maximum exposure—to contamination, to wetting, to natural cleaning by wind and rain. It is typified by short petticoats, spaced to avoid pockets where contamination and moisture can accumulate. In the suspension unit, the smooth underside is also designed for maximum exposure with no restricting baffles to prevent cleaning. Spacing of petticoats is designed to obtain natural cleaning from water flow and splashing from below.

In most areas, no cleaning of Lapp Fog-Type insulators is required. Where a program of maintenance cleaning is necessary, time intervals for cleaning Lapp units may be extended beyond that required for other types of insulators, and the fully exposed leakage path makes such cleaning easy, fast, and economical.

The merit of this principle, and of the design, is confirmed by the service record of Lapp Fog-Type units. Those we ship today look just about like those we produced thirty years ago, and users of these thirty-year-old units have had little reason to look for new concepts of fog design. In the years since, the principle has been adapted to many types of outdoor insulators. Identical fog-type corrugations, used extensively today for high voltage bushings, have obsoleted the wide, spreading petticoats which were previously standard. Major advantages in performance, both mechanical and electrical, of Line Post and Station Post insulators are derived from the adoption of these designs of Lapp Fog-Type corrugations.

You improve the service record of your system, save your company maintenance expense, and improve the sleeping habits of your line crews every time you build a line on Lapp Fog-Type insulators.

Lapp Insulator Co., Inc., Le Roy, N. Y.



**Average new commercial cooking load per year per utility reporting in ELECTRICAL WORLD's surveys. See "2nd Commercial Cooking Survey," ELECTRICAL WORLD, August 27, 1956, Pages 36 to 51. Reprints available from HOTPOINT.*

		COMMERCIAL COOKING FACTS
UP!	Pennsylvania Power and Light Co.	Over $2,000,000 in new E.A.R. in 9 years
UP!	Appalachian Electric Power Co.	$392,000 in new E.A.R. in 1955
UP!	Atlantic City Electric Co.	Over 5 kw new load per customer, 1955
UP!	Southern California Edison Co.	New load up from 6,900 kw (1954) to 16,920 kw (1955)
UP!	Potomac Edison Co.	Commercial cooking saturation now over 19 kw per customer
UP!	Year end projection, 1956 (estimated)	Up 25%

"Commercial Cooking is Hot Load"

(Editorial: Reprinted from ELECTRICAL WORLD, Sept. 10, 1956, page 5)

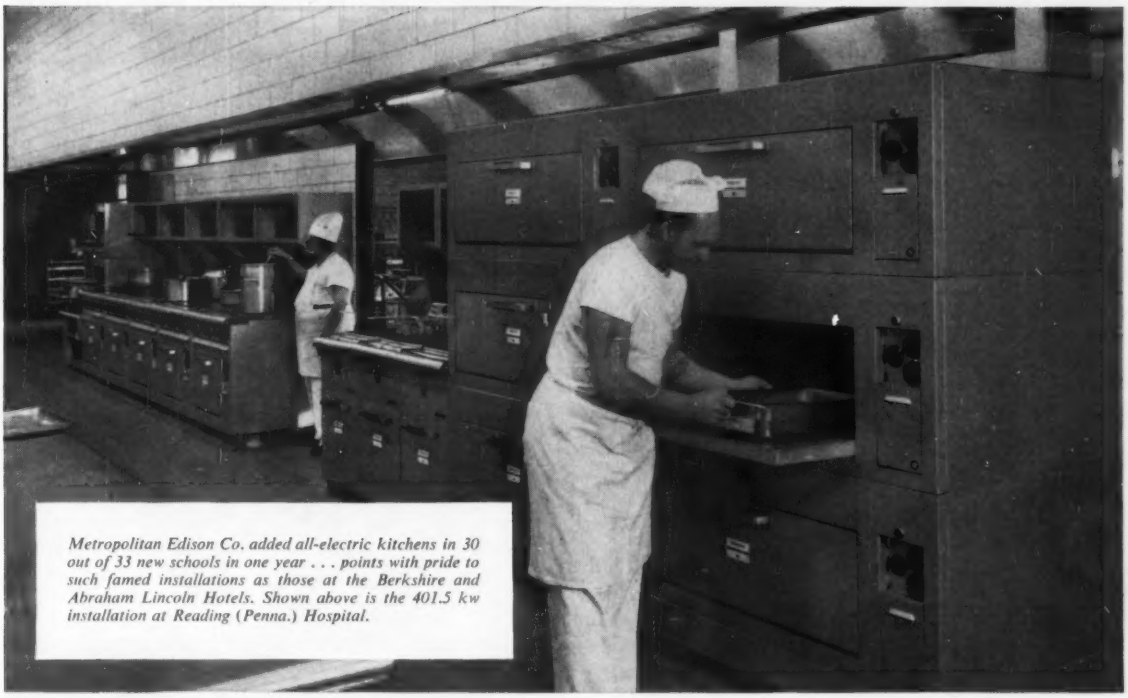
Commercial cooking can no longer be looked upon as just a promising load building opportunity. Today it is solid business.

This is apparent to everyone who read *Electrical World's* second survey in a recent issue (Aug. 27, p. 36). Companies like Appalachian Electric Power and Pennsylvania Power & Light are grossing $2 million and more each year from this single load. Southern California Edison Co. added nearly a half-million dollars of cooking revenues last year.

And the substantial returns are by no means limited only to utilities with large prospect lists. Kentucky Power Co., with only 600 food service accounts to draw on, worked its market for $72,000 in new commercial cooking business last year. Similarly Gulf States Utilities drew $134,000 in new money from only 1,080 prospects.

Cooking kwhr sales for the industry this year likewise look good. Already they're about 25% ahead of '55, according to one equipment manufacturer's estimate.

KW load soars with Commercial Electric Cooking!



Metropolitan Edison Co. added all-electric kitchens in 30 out of 33 new schools in one year . . . points with pride to such famed installations as those at the Berkshire and Abraham Lincoln Hotels. Shown above is the 401.5 kw installation at Reading (Penna.) Hospital.

Like space heating, commercial cooking offers a high concentration of kwhr from few installations. A fully-equipped all-electric kitchen can put a load on a utility's lines of anywhere from 100 kw for a large restaurant to 300 kw or better for a hospital. To a single company with 2,300 food-service customers (the average for the utilities in EW's survey) this means a total potential of:

- 69,000 kw demand (based on a conservative average of 30 kw for each food-service customer). This is the total capacity of a good-sized turbine generator;
- $1¾ million in annual revenues (at $25 per kw).

And, happily enough, commercial cooking diversifies well with other classes of business, has a good annual load factor.

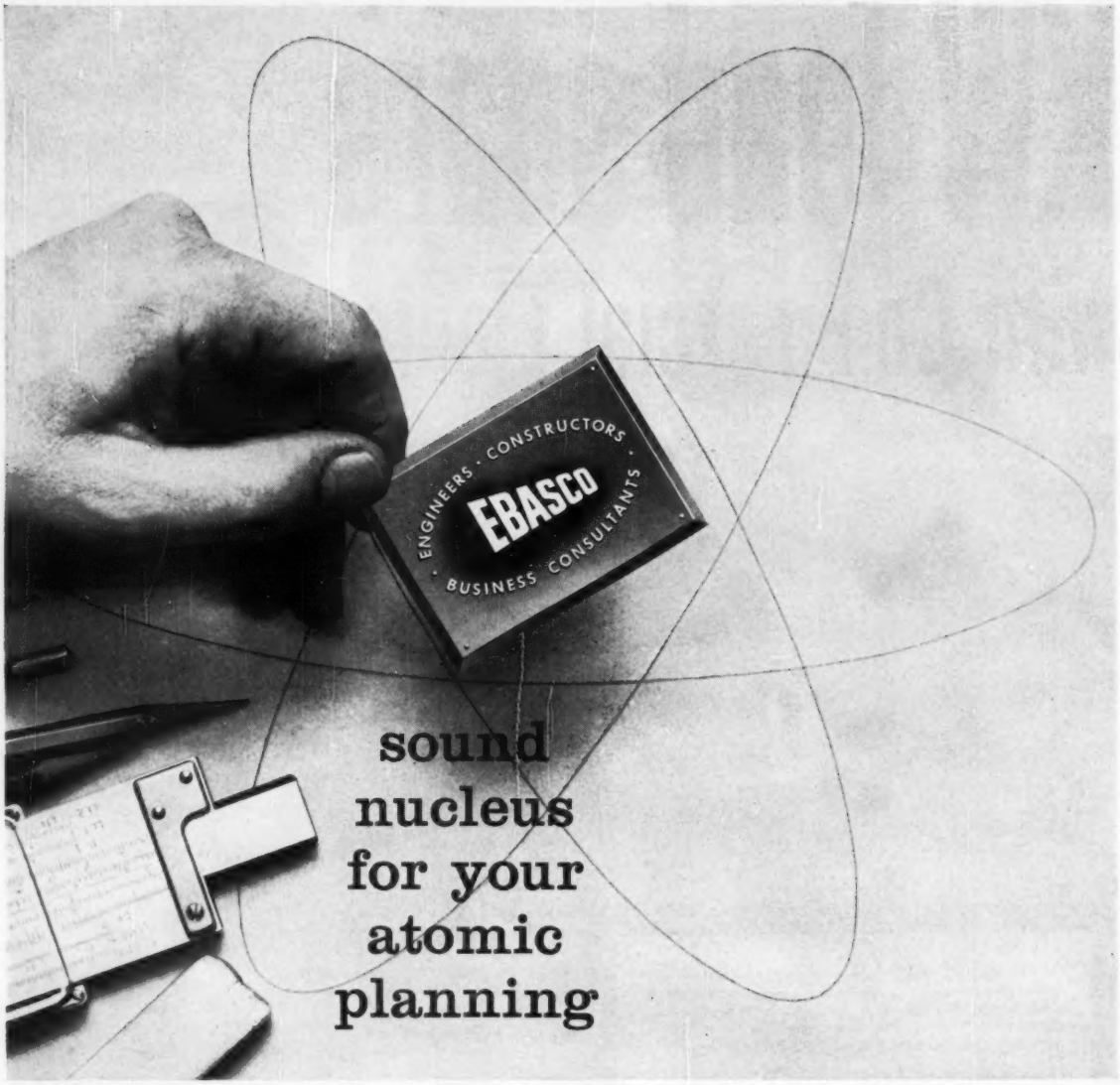
Utilities which go after the load know this. A survey of 34 utilities (EW July 23, p. 97) shows cooking is getting a modest but steadily increasing share of the utilities' commercial promotion dollar—up 43% since 1940. Meanwhile, several other commercial power applications are suffering budget cutbacks.

With at least 533,000 food service outlets in the U. S., whose cooking requirements could total at least 15 million kw, the "poor little rich load" is no longer so poor or so little. As for how rich it is, the figures above speak for themselves.

HOTPOINT has a complete assortment of commercial cooking plans, programs, and facts for power companies. Write, wire or phone us and we will make our full resources available to you.

Hotpoint All-Electric Commercial Cooking

Hotpoint Co., a Division of General Electric Company
Commercial Equipment Department, 265 So. Sealey Ave.,
Chicago 12, Illinois



sound nucleus for your atomic planning

Your planning for the application of atomic energy is in experienced hands when you use the nuclear engineering services offered by Ebasco to industrial firms and public utilities.

Your atomic planning—whatever its stage of development—will benefit from the broad experience which Ebasco's specialists in nuclear power will apply to every phase of the project—from initial planning through ultimate recommendation on specific projects to actual design and construction of plants utilizing atomic energy.

For complete information on the many services offered by Ebasco to business and industry write for "The Inside Story of Outside Help." Address Dept. M, Ebasco Services Incorporated, Two Rector Street, New York 6, N. Y.

In connection with power reactors, research reactors, and related facilities, Ebasco offers these services:

- Nuclear Engineering Studies
- Reactor Systems Evaluations
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- Reactor Start-Up and Testing
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- Coordination with Government Agencies

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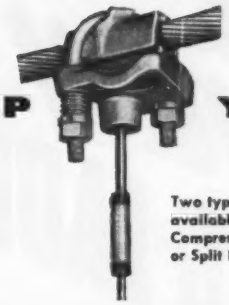
A U-BOLT CLAMP YOU CAN WORK HOT!



Two types of taps available: with Compression Fitting or Split Bolt

BLACKBURN

Here's a hot line clamp for large aluminum mains with all the advantages of a U-bolt connection. Reduces costly service calls and burn-downs. Costs more than conventional hot line clamps—*and worth it!*

Castings and hardware of aluminum alloy. Standard tap of tin plated bronze—compression tap of aluminum.

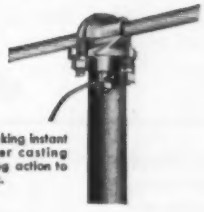
Main—1/0 to 336.4 ACSR
Standard taps—6 AWG to 2/0 AWG
Compression taps—6 to 1/0 ACSR

Patent Applied For

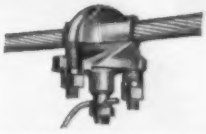
SWIVELOK

Hang over conductor with shotgun stick...

Slam it home and let up on stick.



Up it pops, making instant contact. Lower casting provides wiping action to prevent arcing.



Tighten nuts with socket wrench in stick and you have a trouble-free connection.

Send for your FREE SAMPLE Today!

JASPER BLACKBURN CORPORATION

35 MADISON STREET • ST. LOUIS 6, MO. • PHONE MAIN 1-2821

IT'S HERE the NEW KEYSTONE HDG LADDER MOUNT

Pictured 12" wood strain insulators in truss rods of fly and lower ladders.

This new mount is the answer to horizontal rotating problems on high crowned roads or inclines.

1. Gear box containing two-speed, self-locking worm gears.
2. Two-throw handle.
3. Hand wheel for raising fly ladder.
4. Eight position lock for vertical raising of entire ladder.
5. Vertical ladder with knurled rungs for safety.

New Keystone HDG Ladder Mount equipped with two-speed, self-locking gears for easier horizontal rotating and 12-inch wooden insulators in truss rods.

The new gear box sealed to permit gears to operate in lubricant.

1. Two-throw handle allows operator to select operating speed desired.
2. Low speed, high torque shaft (top) and high speed, low torque shaft (center) affords easy operation regardless of high crowned, inclined or level road.

HKP DISTRIBUTOR H. K. PORTER COMPANY, INC.

Electric Service Works, DELTA-STAR ELECTRIC

17th AND CAMBRIA STREETS

The ONLY Mechanical Ladder Easily Operated on High Crowned Roads or Inclines

Two-Speed, Self-Locking Gears Make Easy Horizontal Rotating

HIGH CROWNED OR INCLINED ROADS NO PROBLEM Overcoming one of the greatest difficulties of ladder mounts, that of horizontal positioning on high crowned or inclined roads, was the prime factor in engineering the new Keystone HDG Ladder Mount. Now with the new two-speed self-locking gear-driven Keystone HDG Ladder Mount, one man can easily spot the ladder in infinite number of horizontal positions. No tugging against heavy load due to necessity of parking on an incline.

WHY IS THE HDG EASIER TO OPERATE? With two shafts—low speed with high torque or high speed with a low torque—plus a two-throw handle, permits operator to select gear ratio best suited for operating conditions. With hardly any effort on operator's part, ladder may be spotted or returned to ladder rest with ease.

WHAT MAKES OPERATING SO EASY? Enclosed in a precision machined gear box are double reduction worm gears. Dirt, dust, moisture and other harmful materials are sealed out to give longer gear life. All gears run in a lubricant to reduce friction. Adjustments for better gear operations can be made when necessary by one screw on the outside of the gear box. All this adds up to easier operation, higher efficiency and longer life with minimum maintenance.

SAFETY FIRST, LAST AND ALWAYS Keeping in mind the operator's safety, the Keystone HDG Ladder Mount is ruggedly constructed to prevent deflection, side sway and twisting. New 12″ wooden insulators are now standard equipment in the truss rods of the fly and lower ladders. Metal rungs on the vertical ladder are knurled to prevent slipping. All wooden rungs are backed up by a safety tie bar on the lower side. Ladder locks in any horizontal and eight vertical positions. Handwheel raises and lowers fly ladder eliminating loose rope on the truck floor. A handwheel brake stops or retards descending fly ladder.

COMPACTNESS AND FLEXIBILITY Keystone HDG Ladder Mount can be rotated horizontally through a complete 360 degrees and locked in infinite number of positions. Ladder Mount fits conventional truck chassis and requires a 42″ diameter for mounting purposes. Available in 24, 28 and 32-foot lengths.

Write today for more information on the NEW Keystone HDG Ladder Mount.

DIVISION, H. K. PORTER COMPANY, INC.
PHILADELPHIA 32, PA.

Wire Sculpture by Henry Szafarz

It's Another World . . .

one in which the forces of nature are extremely rough on man-made things. Thus, the simple fact that Simplex supplies more submarine cable than all other manufacturers combined speaks volumes as to product quality. Simplex Submarine Cables are specifically engineered for reliable underwater communication and power transmission. Their many varieties of outer coverings, wire armor, heavy jackets of Neoprene and other materials, guard against underwater hazards and assure long, dependable service.

SIMPLEX WIRE & CABLE CO.,
79 Sidney Street,
Cambridge 39, Mass.

Photo of Transoceanic Telephone Cable, Cut Back to Show Construction

LIVE BETTER ELECTRICALLY

Simplex

Westinghouse equipment that helps balance cost of voltage regulation with quality of service

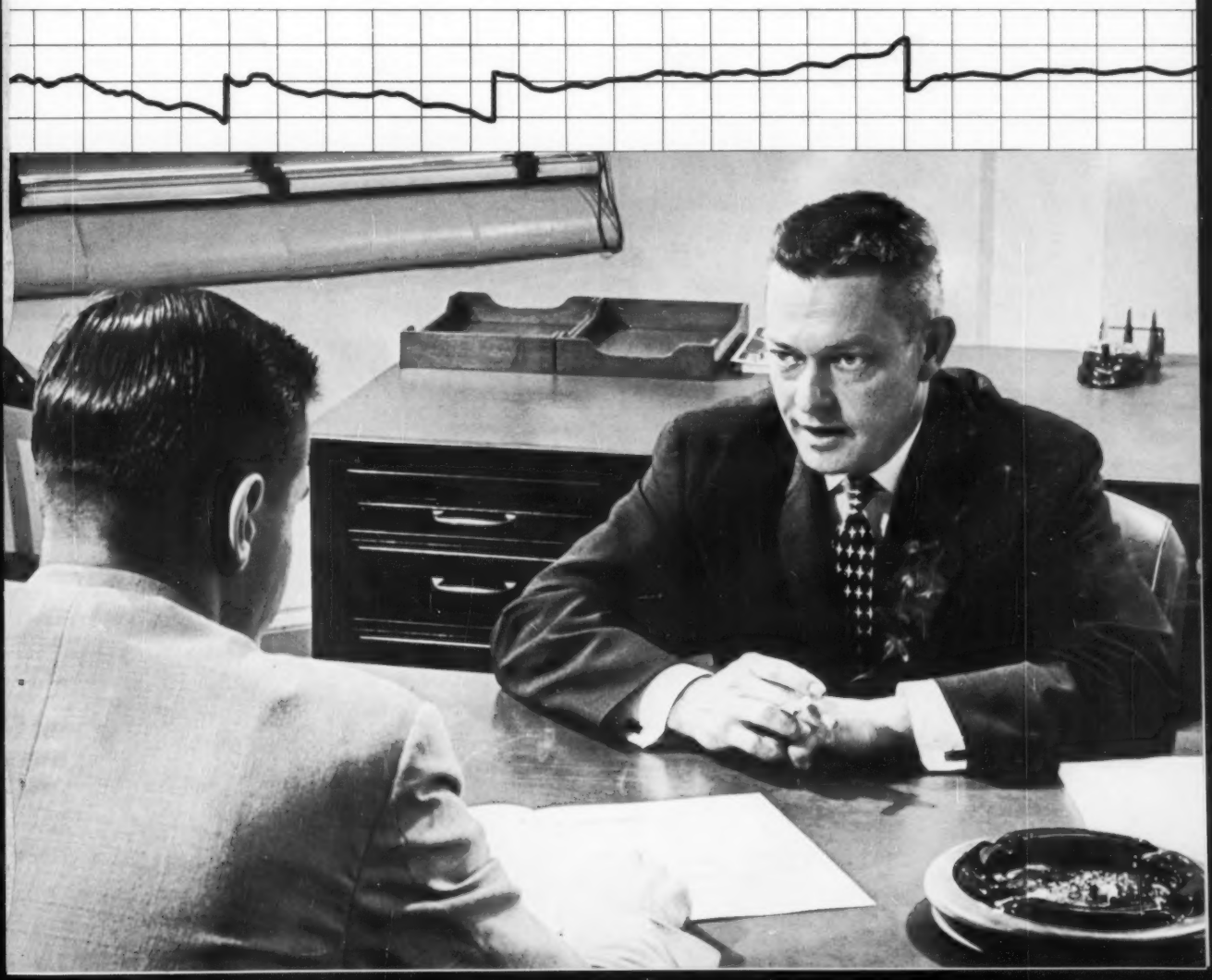
Mr. J. K. Dillard, Manager, Electric Utility Engineering, discusses System Voltage Control:

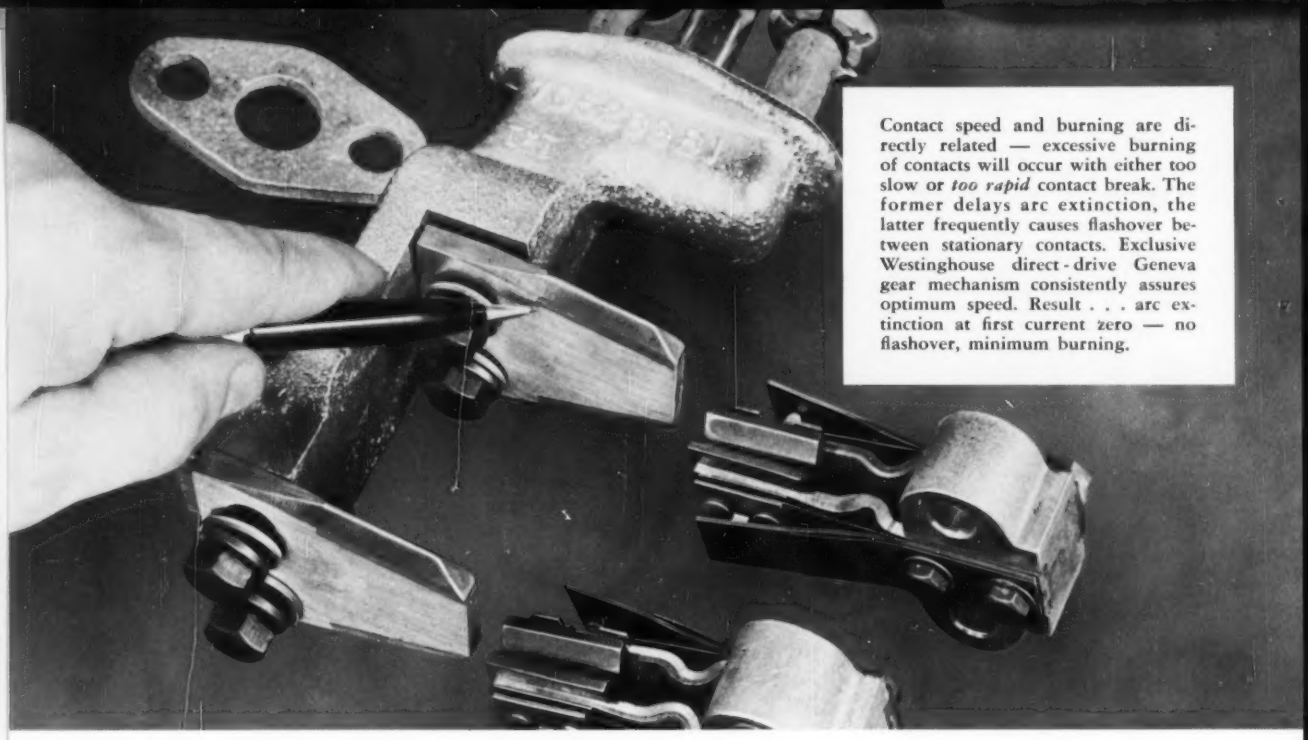
"The Utility Power System is cost sensitive to voltage regulation, a vital factor in quality of service. Westinghouse engineers are continually at work on new ideas and equipment to help solve your voltage regulation problems.

"The following pages show the broad selection of Westinghouse products that make it possible for you to achieve new degrees of voltage control."

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***





Contact speed and burning are directly related — excessive burning of contacts will occur with either too slow or *too rapid* contact break. The former delays arc extinction, the latter frequently causes flashover between stationary contacts. Exclusive Westinghouse direct-drive Geneva gear mechanism consistently assures optimum speed. Result . . . arc extinction at first current zero — no flashover, minimum burning.

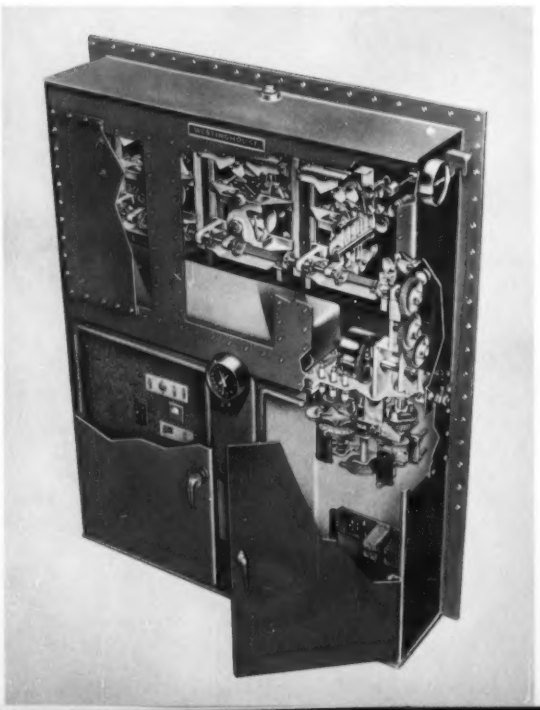
Westinghouse announces 20-year contact life warranty

For URS tap-changing mechanism . . . regardless of number of operations

Field inspections of scores of URS tap-changing mechanisms, in service 8 years or more, show negligible contact wear and burning. Based on this proved performance, Westinghouse now offers a 20-year prorated warranty on contact life — *regardless of number of operations!*

Load tap changers are direct drive; Geneva gear action assures optimum speed of moving contacts to prevent burning. This consistently controlled action is not possible with other types of drives. Geneva gear operation further provides shockless acceleration and deceleration . . . tested to 8 million operations with no appreciable wear.

Result . . . highly accurate regulation, a minimum of operating headaches.



Cutaway of URS operating mechanism reveals industry's only direct-drive load tap changing — positive, consistent, reliable action — backbone of new 20-year prorated life warranty.

New concept in precise voltage regulation

MAGAMP CONTROL

for URS and URT step regulators

Remarkable new MAGAMP* (magnetic amplifier) now standard for URS and URT load tap-changing equipment for both station step regulators and power transformers. MAGAMP sets a new mark in economy of operation. A static, completely sealed sensing device in the Type MS voltage-regulating control, MAGAMP has no moving parts, no need for mechanical adjustments, no maintenance. All settings — band width, balance voltage, line-drop compensation — are made electrically.

The principle of MAGAMP also serves the T.M. time-delay control. One setting integrates time delay for both "raise" and "lower", adjustable in a 5 to 90-second range. Resetting is automatic. In this completely static timing circuit, there is nothing to maintain, nothing to wear out. Relays actuated by this time-delay control have a proved life of more than 25 million operations.

Maintenance-free MAGAMP and unmatched *Geneva gear tap changing* — two of the soundest reasons there are for making this outstanding equipment your next investment in voltage regulation.

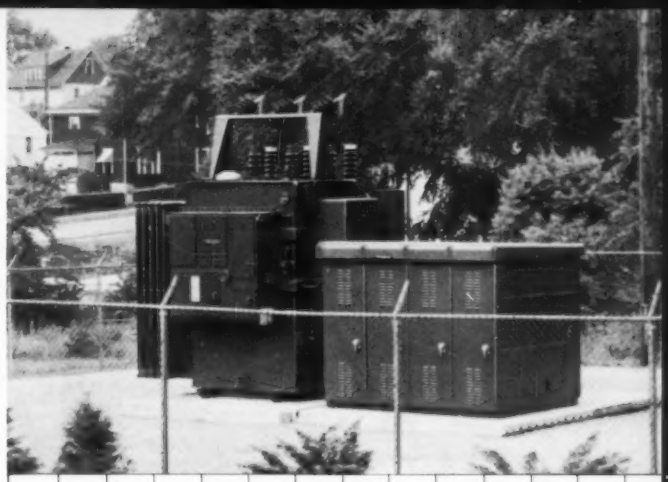
*Trade-Mark

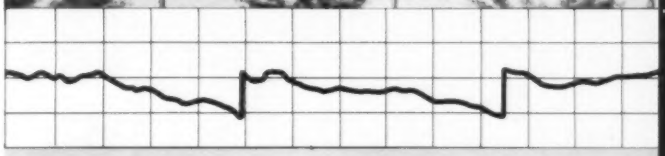
SU INDUCTION REGULATOR

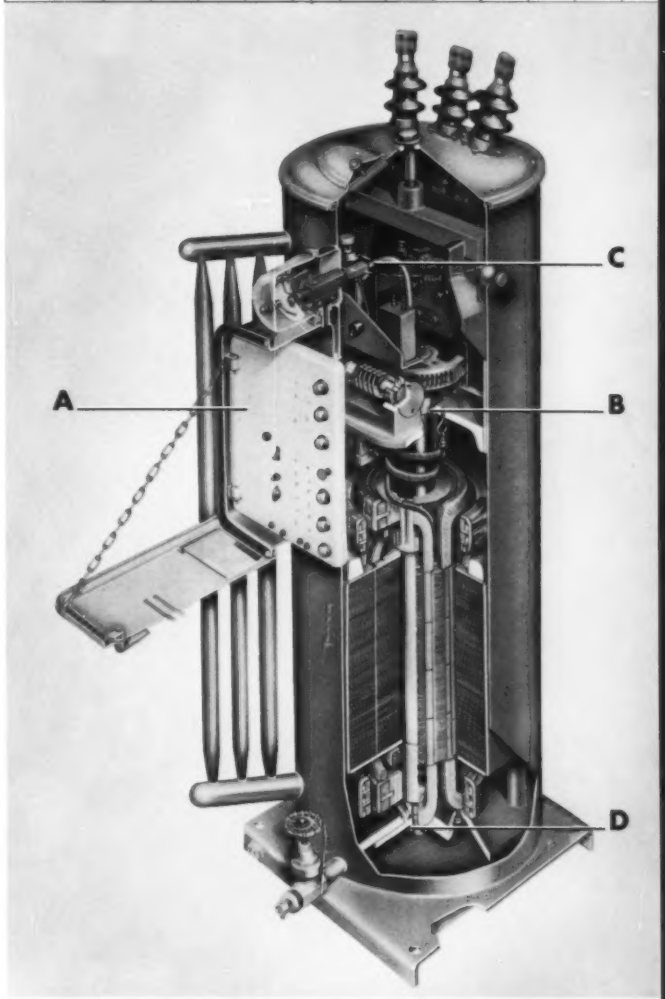
with new 100% compounding MAGAMP gives you *set-it-forget-it* regulation

Two new and exclusive features make the Westinghouse SU regulator a more-than-ever reliable, precise, yet economical voltage control. First, MAGAMP for voltage sensing and motor operation delivers instant pinpoint accuracy. Completely sealed and static, MAGAMP has no moving parts to wear, foul or, consequently, to maintain.

Second, the SU with new 100% compounding returns voltage exactly to set balance level on each correction, thus achieves the narrowest band width — plus and minus a half volt — of any regulator available. The pay-off for you: More revenue dollars through higher effective voltage level.



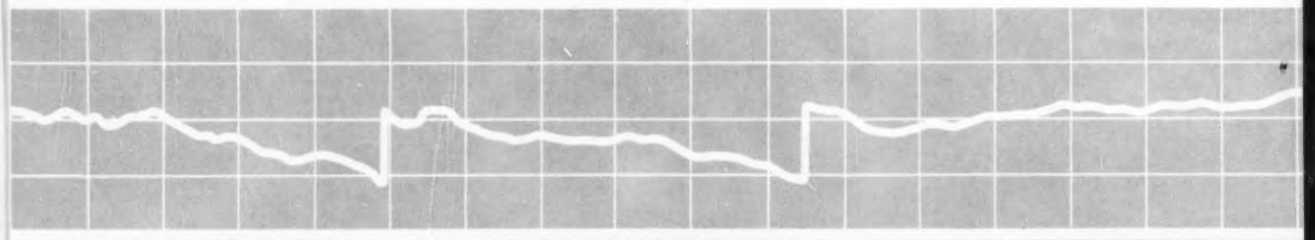


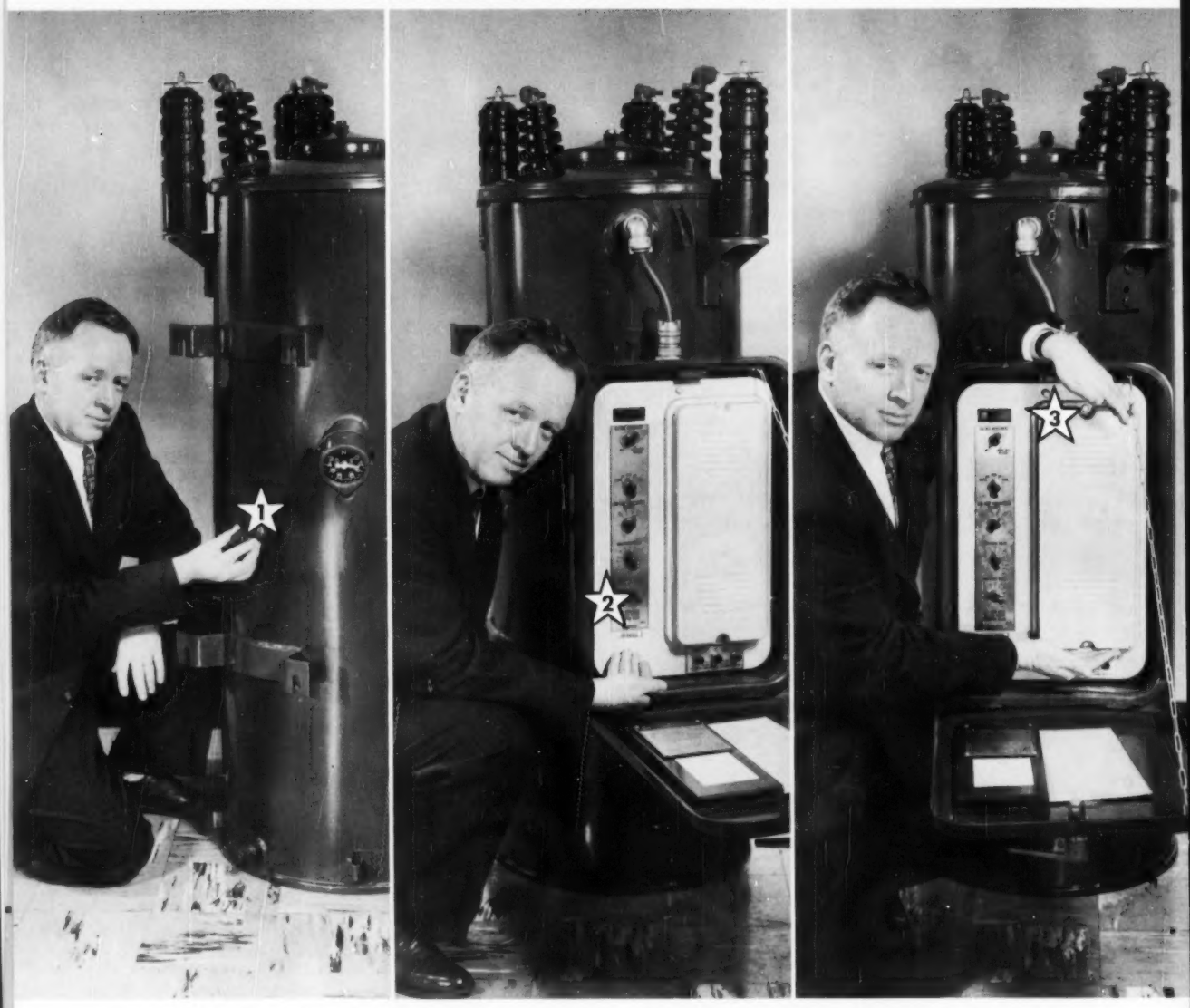


A. Maintenance-free MAGAMP control eliminates all contacts and moving parts. B. Upper bracket and worm gear housing integral castings of nodular iron assure high strength and permanent alignment. C. Swaged adapter assures permanent connection of position indicator drive. D. Permanently preloaded bearings.

WATCH WESTINGHOUSE *WHERE* ***BIG*** *THINGS ARE HAPPENING FOR* ***YOU!***

To improve quality of service with the new Westinghouse URL-16 step regulator . . .





Speed and versatility of the new CVR Westinghouse relay will give you the best obtainable regulation. While pickup or drop of heavy loads can be compensated for quickly — as much as 10 volts in 4 seconds — the relay can be adjusted easily to longer time delays for full range in a 10 to 90-second period for more gradual changes. Above, the URL-16 — (1) exclusive tap-changer compartment drain; (2) simplified control panel with operation counter which aids in keeping accurate operating records; (3) new CVR relay mounts quickly and easily for interchangeability with all previous URL-16 relays.

Unique CVR relay continuously monitors voltage fluctuations, corrects faster

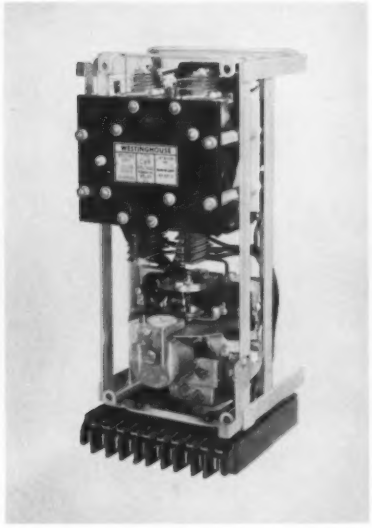
Key to the new performance standards of the URL-16 is the exclusive induction disc CVR relay which actually evaluates the need for speed of voltage correction. The CVR integrates two quantities — voltage and time. (1) It detects rate of voltage change, and (2) it responds with a speed proportional to the rate of change. Sudden or severe line drop — rapid response; slow change — slow response. The greater the need for voltage correction, the faster the relay acts to correct. This double action, combined with a new, faster tap-changer response (full buck to full boost in 13 seconds) gives you precision correction you cannot buy in any other regulator.

Another feature of Westinghouse regulators is the location of tap changer in a separate compartment. This eliminates contamination of transformer oil, fouling of core and coils, and possible flashover faults or overheating. Tap-changer oil is drained separately.

The concept of 1¼% step regulation now takes on new significance as a revenue builder. You can hold to preselected band widths faster, more closely, and more effectively improve voltage level. You get better regulation with less field servicing in the new Westinghouse URL-16.

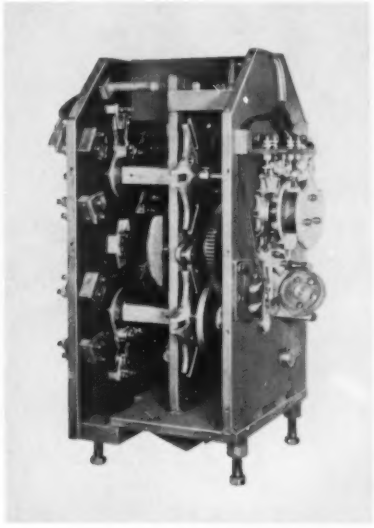
WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*

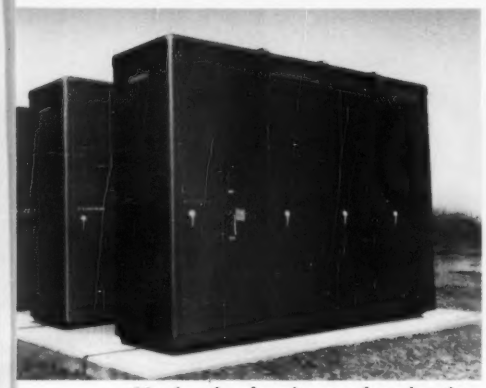


The only settings to be made on the CVR relay are the band width and time delay desired. Full interchangeability with all previous relays used in the URL-16 simplifies field service.

Unit assembly of tap changer and core-coil for greater strength and rigidity. Note separate compartment for tap changer — prevents carbon deposits from entering core and coils.

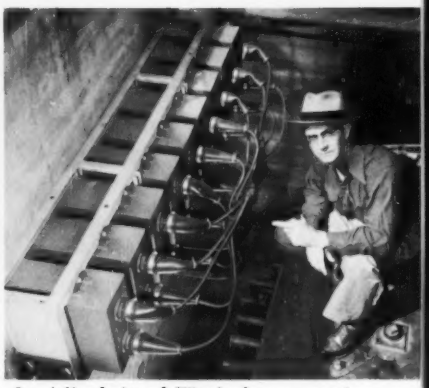


Exclusive Westinghouse direct-drive Geneva gear has no fixed time delay — operates instantly on signal from CVR relay . . . regulator can traverse full buck to full boost in 13 seconds.



Metal-enclosed equipments for substation application assure protection of apparatus and safety of personnel in congested areas.

Westinghouse Autotrol* automatically switched capacitors are factory assembled and connected, ready to install on the pole.



Specially designed Westinghouse capacitors provide quick, economical solutions to the headaches of overloaded networks.

KILOVARS...

You'll need one for every two kw added

Westinghouse capacitors are your most effective, low-cost source

A survey of several major power systems, made just a few months ago, estimates that one kilovar of capacitors should be added for every two additional kw of load . . . yet, already, problem areas on many systems are proving these estimates conservative. The wide range of Westinghouse capacitor designs and the broad experience of Westinghouse engineers can help you add kilovars where they will be the most effective, at lowest per-kvar cost.

Westinghouse capacitors offer real economy . . .

. . . because the basic unit in all Westinghouse capacitor equipments is not affected by climate or temperature extremes.

. . . because Westinghouse equipment is available in laborsaving, factory-assembled units for any type of installation — indoor, outdoor, pole-mounted, underground, in stacks, switched or fixed — for all applications from individual motor to large substation banks.

. . . because standardized racks and enclosures simplify installation.

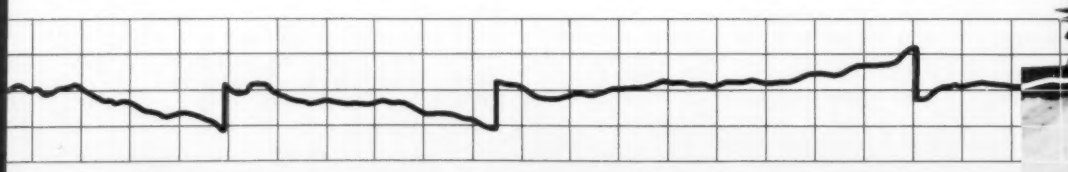
. . . and because continuous improvement in design and manufacturing techniques through a 36-year service record have kept Westinghouse ahead in capacitor development.

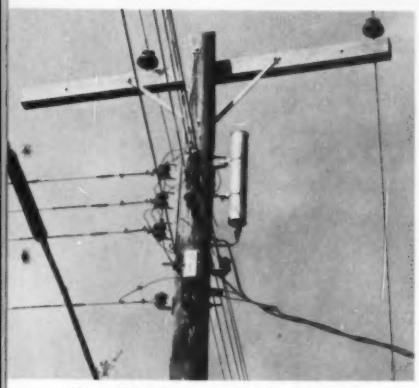
The exceptional breadth of experience by Westinghouse engineers in all phases of power factor correction and voltage control is the final and unequaled asset . . . always available to work with you and your consultants.

*Trade-Mark

WATCH WESTINGHOUSE!

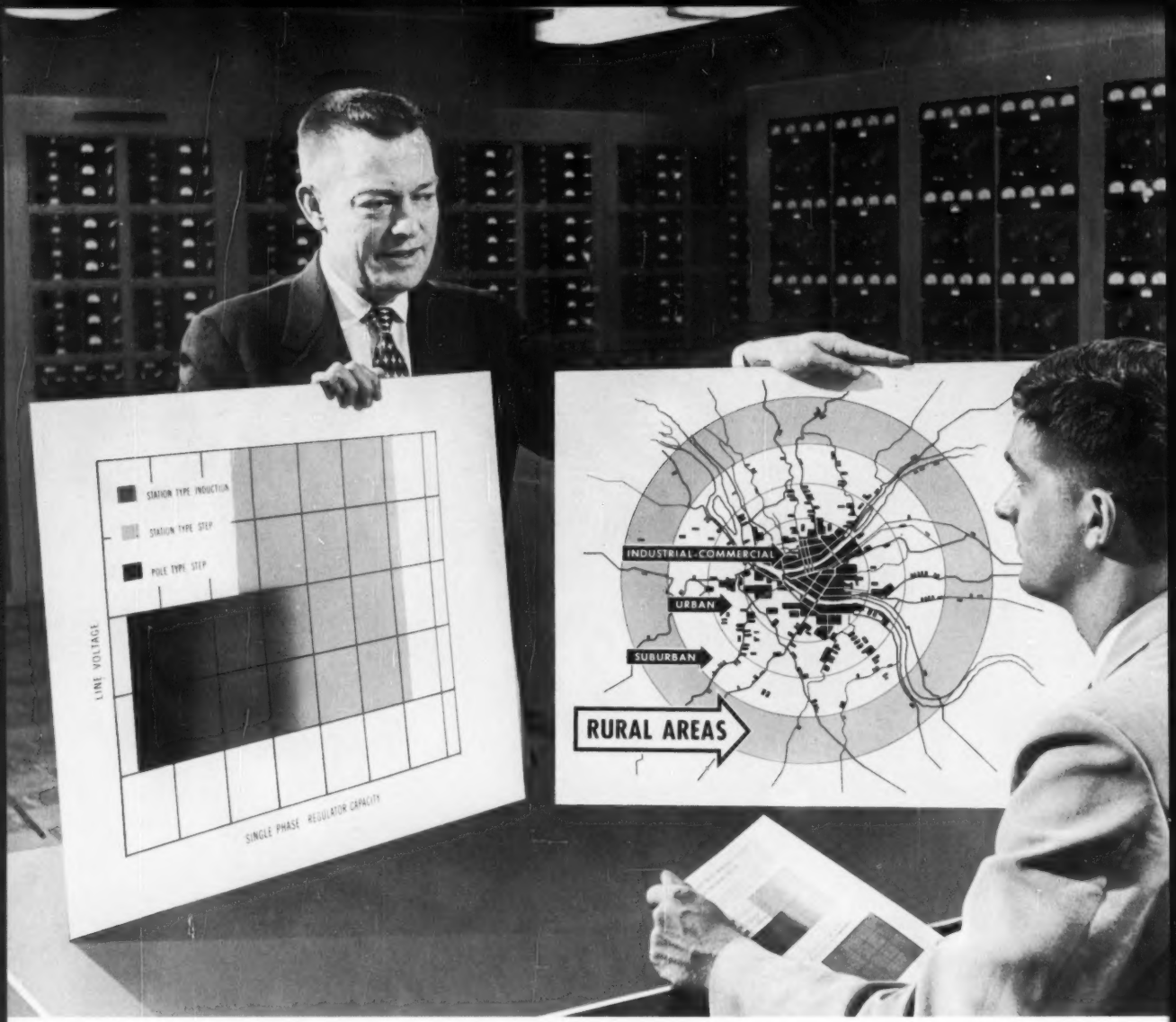
*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*





Type FPS 3, 5 and 7½-kvar distribution capacitors meet the growing needs for supplying kilovars to residential feeders.

A stack-type capacitor installation, like this, consisting of 1005 units supplies 25,125 kvar to offset exceptional I^2X losses on long, peak-load, high-voltage circuits.



More effective voltage regulation per dollar starts with

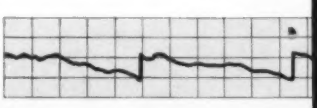
Westinghouse System Analysis and Application Engineering

The trend of modern power systems is well defined. In all directions the signs read "MORE LOAD."

Problems of maintaining proper voltage for both new and established areas are never further away than the following second . . . or the next inch on the system. The answers to proper voltage control depend upon the type of load served, its density, the location of bulk power supplies . . . in short, characteristics of your own particular power system.

In cooperation with your engineers and consultants, Westinghouse can assist with a complete or partial system analysis — the basis for sound equipment recommendations. It's just the kind of assistance that can help you achieve an economical, balanced equipment program, and consistently optimum revenue.

Call your Westinghouse sales engineer for assistance from Westinghouse electric utility engineers, the most experienced in the industry today.



WATCH WESTINGHOUSE *WHERE* ***BIG*** *THINGS ARE HAPPENING FOR* ***YOU!***

CP-1037

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EEI-NEMA
STANDARDS
Here's your quick and ready reference to Thomas EEI-NEMA Standards.
Specify THOMAS INSULATORS — THE BEST BY LINE TEST
The R. Thomas and Sons Co.
LISBON, OHIO

Send for Your Free Copy Today . . .

The complete line of THOMAS EEI-NEMA PORCELAIN INSULATOR STANDARDS is illustrated and identified both by EEI-NEMA Class Numbers and by THOMAS Catalog Numbers.

This new eight-page bulletin is the kind of ready reference you'll want at your fingertips — for convenience in selecting and ordering standard SUSPENSION, PIN-TYPE, APPARATUS, GUY-STRAIN or SPOOL Insulators for all applications.

THE R. THOMAS & SONS CO.
Lisbon, Ohio

Gentlemen: Please send my copy of the new THOMAS EEI-NEMA Standards Bulletin.

Name _____

Company _____

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City _____ Zone _____

State _____

and HONEYLITE—the all metal light diffusing acoustical honeycomb—made the change in record time!

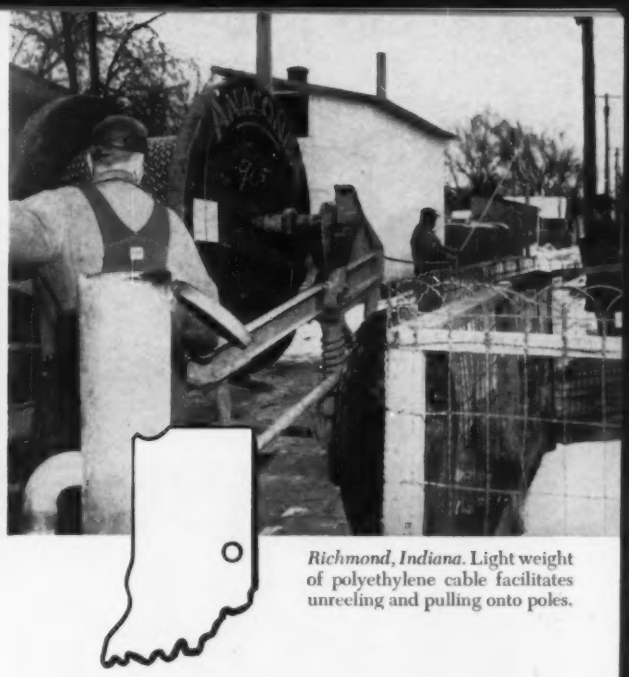
When the Pacific Telephone and Telegraph Company designed this important nerve center for the 1956 Republican Convention at San Francisco's Cow Palace, they had one big goal—to make the room as well-lit and whisper-quiet as possible. That's why they chose a HONEYLITE ceiling! ● *HONEYLITE's amazing efficiency and sound reducing properties transformed the South Barn of the Cow Palace into this restful room—a room in which scores of messengers and 60 telephone representatives handled more than 4,000 long distance telephone calls a day. And HONEYLITE's 45° shielding turned a room designed for livestock into a setting for pretty telephone girls. HONEYLITE's low weight (2 ounces per square foot) meant that only the simplest T-bar suspension system was needed. On-the-job cutting and fitting reduced the man-hours needed to install the contoured ceiling to a minimum.* ● *The full air circulation given by all-metal, UL approved HONEYLITE made sure the Bell Telephone Center was not only smoke-free, but cool and fun to work in.* ● *For price lists and detailed information see your dealer or write to Hexcel Products, Inc., 951-61st Street, Oakland 8, California.*

HONEYLITE®

LIGHT-DIFFUSING ALUMINUM HONEYCOMB

A development of HEXCEL PRODUCTS INC.

Scott County, Virginia. Rugged terrain requires lightweight polyethylene-insulated aerial cable.



Richmond, Indiana. Light weight of polyethylene cable facilitates unreeling and pulling onto poles.

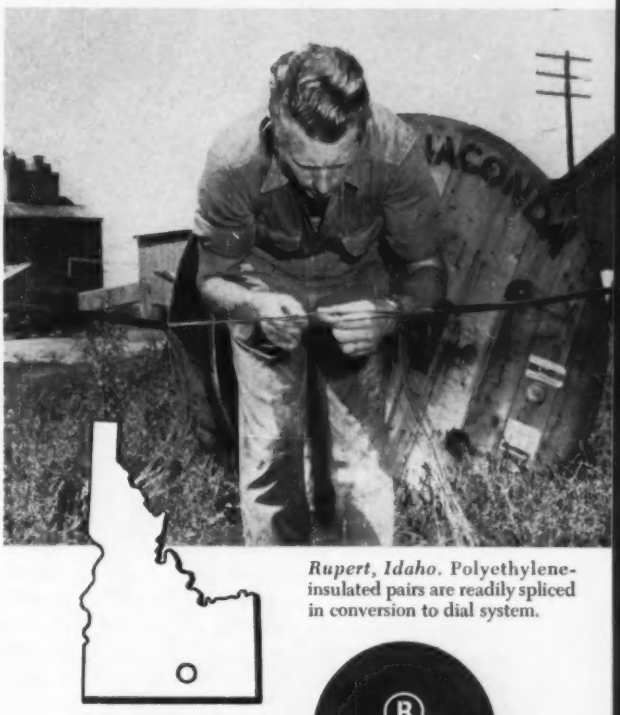
More telephone installations show

why polyethylene is gaining ground

Every user of wire and cable can profit from the years of experience that the telephone industry has now accumulated in the use of BAKELITE Brand Polyethylene. Across the country, exposed to varied climatic conditions and problems of terrain, polyethylene has demonstrated its superiority over older insulating and jacketing materials.

The light weight and toughness of BAKELITE Polyethylene have brought faster, less costly installation with longer spans, fewer poles. Its moisture resistance has drastically reduced weather problems. Its dielectric strength far exceeds telephone requirements.

BAKELITE Polyethylene meets REA requirements for plastic-insulated telephone cable, IPCEA specifications for power cable, ASA standards for weatherproof wire, ASTM D1238-52T Type II dielectric materials, and IMSA specifications for fire alarm and signal control cable. For more information, write Dept. VG-53.



Rupert, Idaho. Polyethylene-insulated pairs are readily spliced in conversion to dial system.

Illustrations show cable produced by Anaconda Wire & Cable Co., New York, N. Y.

BAKELITE
BRAND
Polyethylene Plastic

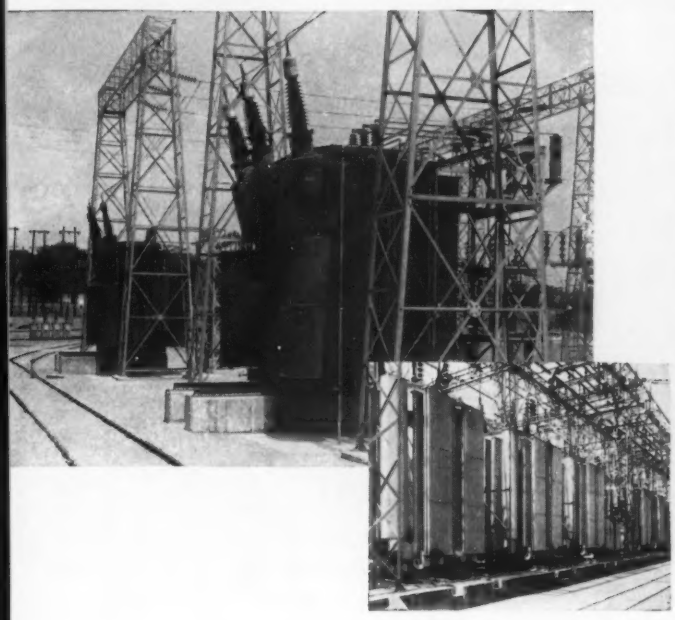
BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC.

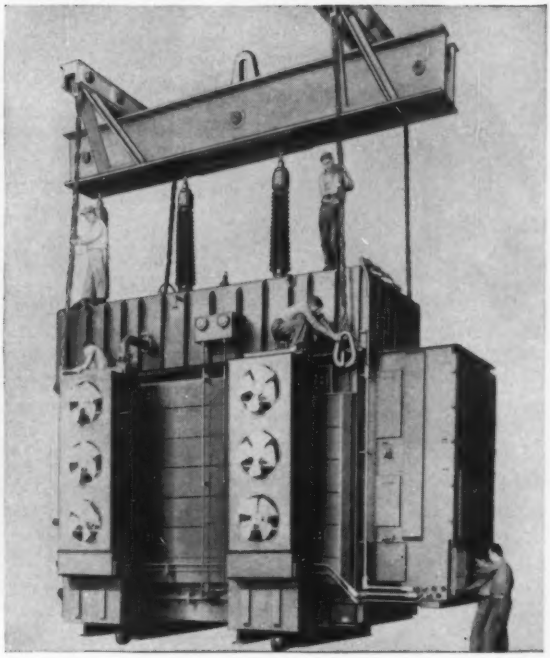
MOLONEY ELECTRIC

Power Transformers • Distribution Transformers • Load Tap Changing Transformers
Primary Unit Substations • Secondary Unit Substation Transformers
Subway Transformers • Industrial Dry Type Transformers

SALES OFFICES IN ALL PRINCIPAL CITIES

A NUMBER...





Any number that fits your needs . . . Kva that is, and Moloney can supply it. Regardless of the rating required, Moloney has the engineering experience, the facilities and the capacity to produce the transformers you need.

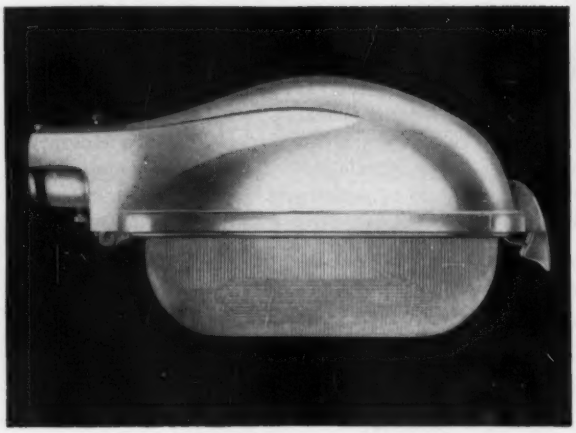
Of primary importance to utilities is the fact that Moloney Transformers in the field have unequalled operating records. Then too, Moloney engineering is recognized for the ability to solve problems that are unique to particular utility systems. This engineering ability and experience, functioning within the confines of the industry's finest facilities, leads to the production of transformers of any size and rating that are best suited to perform as specified. Add to this Moloney field-proved, revolutionary load tap changing equipment and you have the nucleus around which to build the best transmission and distribution installations.

MEB6-26

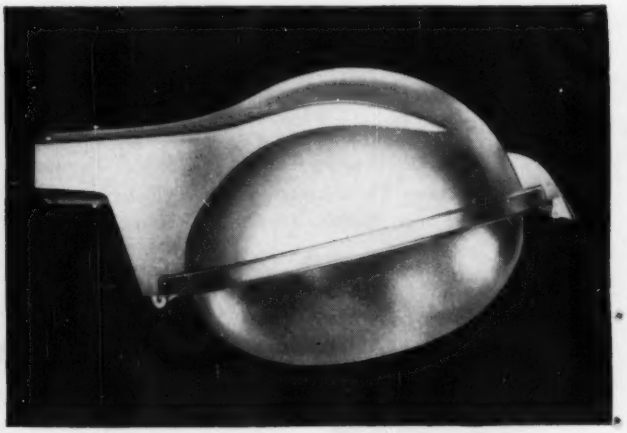
MOLONEY ELECTRIC COMPANY

Regulating Transformers • Step Voltage Regulators
Network Transformers • Series Street Lighting Transformers
Capacitors • Transformers and Inductors for Electronics

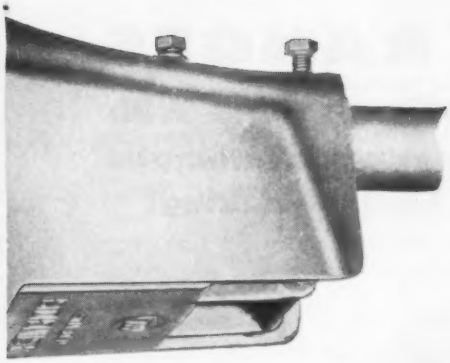
FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA



OV-20 uses 11,000-lumen CH-5, 15,000-lumen AH-1, 20,000-lumen EH-1, and 19,000-lumen JH-1 mercury lamps. Type II, III and IV distribution.



OV-60 uses 35,000-lumen AH-18, 33,000-lumen BH-18, 52,000-lumen AH-15, and 49,000-lumen BH-15 lamps. Type IV distribution.



New Westinghouse OV-35

. . . *the first luminaire designed specifically for fluorescent mercury lamps*

Westinghouse, pioneer in the development of mercury street lighting — the OV-20 and OV-60 — now presents the OV-35 luminaire which can be used with the 400-watt J-H1 or the 700-watt B-H18 fluorescent mercury lamps.

This third member of the Westinghouse mercury group now offers you a complete selection of mercury luminaires for any roadway application — regardless of width or traffic conditions.

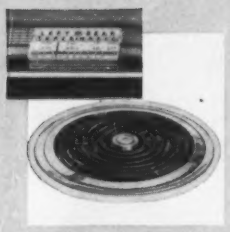
The new OV-35 is the first street-lighting luminaire to include a completely sealed optical system — bugs, dirt or moisture cannot get in. Like the OV-20 and the OV-60, this new luminaire assures the best possible night visibility and a greater uniformity of pavement brightness. It inherits their same outstanding plus features, too . . . such as one-piece cast aluminum housing, new optical system, one-hand maintenance, and smooth good looks.

Whatever your roadway lighting requirements, be sure to specify Westinghouse mercury luminaires. More information? See your nearby Westinghouse representative. Or, write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio. J-04405-X

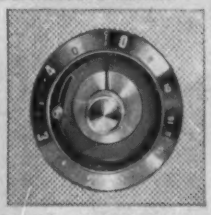
WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***

Super-Matic



AUTOMATIC SURFACE UNIT . . . fry, boil, saute, pan broil and grill with thermostatically controlled, balanced heat at all times.



AUTOMATIC MEALTIMER . . . Select desired Super-Matic heat and set MEALTIMER for time food should cook—on surface or in deep well. Food cooks at the proper heat for the proper time, then it shuts itself off . . . automatically!

AUTOMATIC FRENCH FRYER, DEEP-WELL COOKER . . . makes soups, stews, economy meals—even bakes under controlled heat.

AUTOMATIC CUSTOM COOKER-SERVER . . . it's a frying pan, a grill, a waterless cooker, even a Dutch Oven. Precision timed and heat controlled by the Super-Matic Calrod® Unit and Mealtimer.

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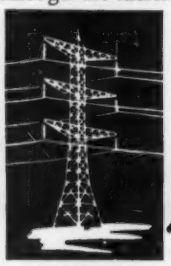
Hotpoint
ELECTRIC RANGES
—Building Increased Utility Revenue With Advanced Automatic Electric Cooking!

SUPER-MATIC COOKS ALL WAYS...AUTOMATICALLY!

Hotpoint Electric Ranges cook everything in the book—*automatically!* With a range line already loaded with super-cooking features, now they can fry . . . bake . . . broil . . . simmer . . . stew . . . deep-fry . . . grill . . . *all automatically* with Hotpoint's new SUPER-MATIC!

Hotpoint's Super-Matic offers the homemaker undreamed of convenience . . . unmatched freedom from time-consuming cooking chores . . . *plus* faster, more precise cooking.

And Hotpoint's Super-Matic offers utilities expanded revenue through the increased demand Super-Matic is building for automatic electric ranges.



Have your Hotpoint Distributor Show You The Complete NEW Hotpoint Range Line for '56 . . . Six New 39" Models . . . Two New 30" Models . . . And Five Beautiful Hotpoint Colortones, As Well As Classic White.

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EDITORIALS

You Can Use Computers – More and More

Digital computers, today, are fast coming into their own for the solution of power system problems. Their use is no longer restricted to research and to such business computations as stock records and customer billing. Today they are becoming general purpose devices. But their engineering application to power system problems rests largely with those who have the incentive and opportunity to apply them effectively. For many utilities today the incentive is great and the opportunity almost unlimited.

Computers of the analog type like the ac network calculator and the economic dispatch computer have long ago proved their worth to power system engineers.

But the digital computer, on the other hand, was being used by utility accounting departments before the full potential of its use on engineering computations was apparent. However once engineers realized it would solve almost any problem for which an equation could be written—and do it repeatedly once the solution was translated or programmed into computer language—they seized on it eagerly.

Today the list of system problems that utilities have programmed and solved is not only getting longer; but programs have been published, and others are being traded among groups of computer users. One such group operating today calls itself "Share." Solutions have been programmed for such system calculations as interconnection loss formulas, transient stability swing curves, fault current calculations, determination of equivalent star networks, temperature ratings for cables and the like.

Accelerated application of computers to utility problems is inevitable for this new tool holds the answer to many situations that are plaguing engineering managements, among them:

1. Increasing complexity of utility engineering.

2. A shortage of engineers that promises to increase.

3. Charges that engineers are being overworked.

Ebasco's E. E. George summed up the opportunities and incentives inherent in digital computer use this way for engineers of the Southeastern Electric Exchange:

"The application of automation to engineering calculations will do much to relieve engineers of the monotonous routine work and make them available for more important and more interesting assignments, including the tinkering required to set up problems for computer programing.

"We are continually told that engineers are not doing real engineering, and it is certainly true that much of their time is taken up with office routine, records, filing and file searching, routine computations and such. We know of many engineering studies that could be made if they didn't cost too much and if we had time to assemble and analyze the data and calculate the answers.

"Now, if we use computers, we have the time."

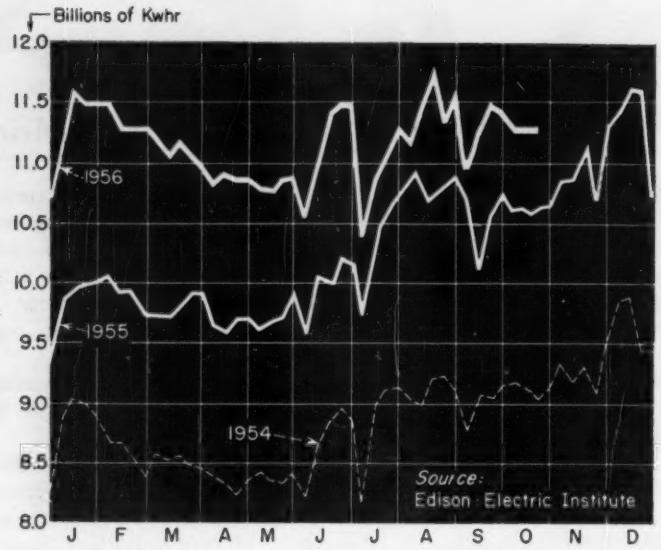
More Mechanization – Tomorrow's Need

The utility industry today is reaping the benefits of intense efforts over the past few years to cut operating expenses. This is demonstrated by the fact that since 1948 operating ratio has dropped from 52 to 44.4%. Mechanization and modern methods engineering have had a lot to do with the savings in fuel, wages, and maintenance that these figures reflect. The achievement is especially impressive because it was made against the rising tide of labor and material costs without sacrifice to service quality and while holding the line on average cost of energy.

The pressure to cut operating expenses even more will continue to mount. There is ample evidence at hand to prove that the cost of labor and material will continue to rise. Moreover, as utility systems continue to expand in the face of a shortage of skilled manpower, their problems will increase in number and complexity.

Such an environment puts a premium on improved operating efficiency, work simplification, and methods engineering of the type and kind that are the subject of a report on cost cutting in this issue.

Progress to date has been great. But tomorrow's need will be greater.



OUTPUT

Week ended Oct. 20, 11,333,000,000 Kwhr Up 6.5%

Atomic Energy Commission requirements—1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 6.2%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Oct. 20	+6.5	+4.5	+3.4	+4.5	+8.6	+4.8	+18.0	+7.8	+13.5	+6.6
Oct. 13	+6.6	+5.8	+3.6	+5.9	+8.8	+5.1	+15.2	+10.3	+9.6	+5.7
Oct. 6	+6.6	+5.5	+4.4	+5.8	+7.2	+6.2	+9.3	+11.4	+7.6	+9.2

Seasonally Adjusted Index 219.0 Week Ago 217.9 Year Ago 205.4

Here are the issue's highlights . . . Thirty-three utilities set up storm-warning network . . . Pacific G&E plans giant underground powerhouse . . . Union Electric's power production seriously periled by area drought . . . Ancher Nelsen and Claude Wickard, both former REA Administrators, seem to be losing their bids for office this year . . . O'Mahoney report blasts Ebasco and Washington Water Power, but retorts come quickly . . . Puerto Rico's Water Resources Authority was set for Hurricane Betsy; power restoration was effective . . . Unions act to stop all work on PRDC's reactor at Monroe, Mich. . . . Nuclear expert predicts "atomic substations" . . . Phelps Dodge adopts new corrugation method for aluminum sheathed cable.

Some 480 heat pumps are slated for Columbus, Miss., air base. Four-County Electric Power Association will serve the military housing project. Bids will open shortly after Dec. 4.

Nuclear power may become competitive "somewhere between 1961 and 1965." This is a view now holding general acceptance, Fred W. McCloska, a Sargent & Lundy partner, told Wisconsin Utilities Assn convention after announcing start-up planned for Argonne National Laboratory's 5,000-kw boiling water type reactor within two months.

U. N. approves statute for International Atomic Energy Agency, bringing President Eisenhower's idea for a world pool of atoms-for-peace close to reality. After ratification by 18 nations, agency will headquarter in Vienna.

Morgan, Stanley & Co group wins $40 million **Consolidated Edison of N. Y.** first and refunding 4¼% bonds (Aa) due 1986 at 101.4291; reoffers at 102.14 to yield 4.125% . . . Glore, Forgan & Co group wins 170,000 common shares of **Central Illinois PS** at $28.33 a share; reoffers at $29.125.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire—Sen Everett M. Dirksen (R-Ill.) scores staff report of Antitrust and Monopoly Subcommittee, of which he is a member, on attempted merger of Puget Sound P&L and Washington WP (see p 63). Publication was deliberately delayed, he says, to "obscure the real issues and confuse the voters" during election campaigns . . . **SWPA preference customers with 50% load factor will pay 6.97 mills/kwhr** if recently completed rate studies are adopted by FPC. Assistant Interior Secretary Fred Aandahl says new rates will be discussed with customers before filing. Previously 7.71 mills was proposed.

Nevada applies for share of Glen Canyon Dam power. Sen Alan Bible (D-Nev.) filed for Pahrump-Ash Meadows Improvement Assn for 21-million kwhr a year after having argued before his Senate Interior Committee that Nevada "qualifies under general reclamation law as a preference customer." He noted the proposed Bridge Canyon Dam, "closer to Nevada markets would help more."

In the Pacific Northwest: Columbia River's natural channel is closed by rock wing at The Dalles. Diversion of water through eight skeletonized east-end powerhouse units last fortnight marks another milestone in $260-million project. First power flows late next year. Ultimate capacity is 1,716 Mw . . . **Proposed Columbia basin power generation should be constructed with all possible speed,** utilizing "all sources of capital" available, says nonpartisan, nonpolitical Columbia Empire Industries, Inc. Studies indicate the area will require 11,000 Mw by 1960 and 22,000 Mw by 1975 vs 7,500 Mw today . . . **Bids for first seven turbine units for Rocky Reach hydro project** on Columbia are called by Chelan County PUD for Nov. 19 opening at Wenatchee, Wash. Turbines are to be rated 140,000 hp (full gate) under 92-ft net head with at least 90% expected efficiency . . . Rising Columbia and coastal streamflow enables BPA to restore 200 Mw to 13 electroprocess industries curtailed Oct. 1. Favorable weather may bring restoration of additional 300 Mw.

Alabama Power Co and Ozark (pop. 5,238) can't agree on price of utility's holdings and equipment for sale to the city. They've asked state PSC to determine the sales price. Alabama Power is asking $4 million.

ABOUT PEOPLE IN THE INDUSTRY

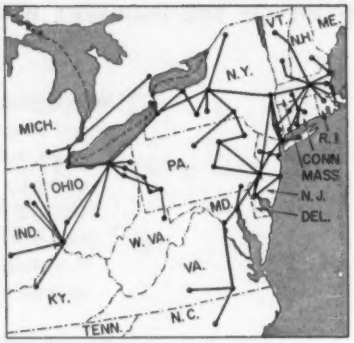
"TVA has no intention or desire of expanding beyond its present area, thereby encroaching on private producers," declared TVA Chairman **Herbert Vogel** recently, adding that the demand for electricity in TVA's present territory is big enough for both private and government industry. "Because TVA is a government enterprise," he said, "it is something of a political issue and it should not be."

"We are certain of success for the second annual observance of National Electrical Week as an all-industry event," predicted NEW Committee Chairman **Merrill E. Skinner.** He said the nationwide program planned by Westinghouse, "plus local community observances staged by power suppliers, distributors, manufacturers . . . and electrical leagues . . . is the kind of cooperation we are receiving throughout the electrical industry."

More News About People page 150

Storm Network Gets Trial

Thirty-three electric utilities in northeast set procedures for exchanging weather and damage data on hurricanes and other natural disasters



Utility storm-warning network blanketing the northeast quarter of the nation is now set up for a trial run.

Under sponsorship of a task force of the Edison Electric Institute's Transmission and Distribution Committee, the communications network initially encompasses 33 electric companies. Area covered is from Ohio and Michigan eastward to the Atlantic and from the Carolinas northward to New England.

Procedure currently being tested is designed to permit the widespread exchange of weather and damage information in connection with storms, hurricanes, and other natural disasters. Such information, of course, is to be tailored exclusively for utility needs. By reporting precisely the nature of damage occurring in an area already hit, it is felt the utilities in the path of the oncoming storm can be better prepared for the onslaught.

The network will use existing communications channels wherever possible. These include power line carrier, microwave, and two-way radio. Where necessary, telephone toll lines will be used. In a number of cases, there are existing networks on a state or regional basis. The Ohio group, for instance, is talking in terms of permanent and close-knit communications among utilities in that state. Electric utilities in the Carolinas and Virginias recently announced a five-company mutual assistance procedure which includes instant communications. And utilities in Pennsylvania have maintained a mutual assistance roster and paved the way for the larger network which could eventually become nationwide.

It is stressed by utilities participating that information carried on the network will supplement, rather than replace Weather Bureau reports.

Already 47 electric utilities scattered throughout the country have indicated an interest in participating in the storm warning network. But only the 33 in the northeast are taking part in the present trial run.

PG&E Plans Giant Underground Powerhouse

Economy and added power are key factors in projected 128,000-kw Haas facility, largest of its type in the U. S.

Contract for the first large underground powerhouse in the U. S. and for excavation of 6½ mi of tunnel has been awarded by Pacific Gas & Electric Co to Morrison-Knudsen Co, Inc, Henry J. Kaiser Co, Macco Corp, and B. Perini & Sons, Inc, a joint venture.

The 128,000-kw facility, known as Haas Powerhouse, will be located on the North Fork of Kings River, Fresno County, in a solid rock chamber 500 ft vertically below the surface and 2,000 ft inside the mountain from the river in the rugged granite canyon of the Kings.

The underground scheme is part of the company's 261,500-kw, $80-million Kings River Development, and was adopted at Haas on the basis of being lower in capital cost and producing more power as a result of decreased head loss.

Water will be carried to the plant from Wishon Reservoir, now under construction, through a horseshoe-shaped pressure tunnel 32,800-ft long and 13 ft in diam, and 4,500 of heavy steel penstock pipe. The last 850 ft of penstock will be encased in a steeply inclined tunnel connected to the powerhouse chamber.

In some cases resistance to bombing and safety against snow-induced avalanches have been overriding consideration for location of power plants underground. But in almost every case the reason for placing the plant underground is one of economics.

Economy was a major factor in the adoption of the Haas underground plan for the following reasons:

- The Haas design reduces considerably the length of penstock with steel plate from 2 to 3 in. thick. This is replaced by unlined tailrace tunnel that costs only about one-fourth as much as penstock.
- The adopted scheme provides 28 ft more effective head, which adds to the total saving.
- The penstock is placed deep in an excellent formation of massive granite. And the profile at the lower end of the high head (2,400 ft) penstock is relatively flat. For much of the underground portion of the penstock, steel thickness is reduced by using higher design stresses in the penstock, which, in this area, will be concrete backfilled and grouted. Thus, the shell need be only 1½ in. thick in this stretch rather than as much as ¾ in. thicker.
- Improved features, including the shut-off valves, which are located in the machinery hall excavation rather than in a separate valve chamber excavation as is usually the case.

Construction of an underground plant—even in excellent granite—was estimated to cost more than a similar surface installation. The scheme was made economic by the saving in penstock construction cost and reduction of head loss.

Drought Perils Union Electric Power

Mississippi may drop to a record low in November. Power 'brownout' may result

Union Electric Co of Missouri is now facing, for the first time in the company's history, what might turn out to be a really critical shortage of water in the period beginning toward the end of November. Prolonged drought is threatening to cut the mighty Mississippi River to record low levels.

The Army Corps of Engineers at St. Louis has predicted that after Nov. 20 the Mississippi could be expected to fall below the previous low of minus 6.2 ft, experienced very briefly in January 1940. The engineers said the river might continue downward below that level if rains did not come, and that a heavy freeze upriver would make matters much worse.

Significantly, the engineers pointed out in mid-October that the Mississippi would have reached minus 6.0 ft at St. Louis at that time had not the river's natural flow been augmented by water from reservoirs of the Upper Missouri. The Missouri waters, entering the Mississippi just above St. Louis, were keeping the St. Louis stage at about minus 2.7.

Union Electric Co had to reckon, however, with the fact that releases from the lower-most of the Upper Missouri reservoirs, Gavins Point Dam in South Dakota, were to be drastically decreased in seasonal reductions by Nov. 15. The planned reduction was from summer flows of about 34,000 cubic ft per second to about 7,500 cfs.

May Have to Drop Load

The Union Electric situation "could become urgent" by reducing the company's generating capacity and forcing it to shed industrial load in the St. Louis area, a company spokesman told Electrical World.

In the St. Louis area, the half-billion dollar concern's facilities include the relatively small Ashley power plant in St. Louis, the Cahokia and Venice 1 and 2 plants across the Mississippi in Illinois, and the new Meramec plant, 12 miles south of the city. These have a combined generating capacity of approximately 1,270,000 kw.

LOW WATER CONDITIONS, shown by banks and mud flats, can be seen on Missouri side of river below Alton dam and lock. Water depth at lock was 7.6 ft

For cooling and condensing purposes, the plants suck up from the river an average of 1.2 billion gallons of water a day, most of which of course is returned. This is many times the daily consumption of the city of St. Louis. It represents about 1,800 cfs, or about a twentieth of the river's flow past St. Louis.

Ashley Plant May Be Lost

Union Electric's spokesman said that when the river stage dropped to minus 6.0 the Ashley power plant's generating capacity would be lost because its pumps could not draw up river water. The plant still could be used for production of steam for heating downtown buildings, which is one of its missions.

As the river dropped below minus 6.0 there would be a gradual loss of the power-generation capacity at other plants, amounting to 10 to 15% of capacity at minus 7.0. "We can easily handle that situation with reserves, and will be all right except for unforeseen accidents," the spokesman said.

But at minus 8.0, he continued, Union Electric's capacity would be so reduced that a third of it would be inoperative. At that point, Union Electric would have to shed industrial load, and part of industry in the St. Louis area would have to shut down.

Col George E. White, Jr, Corps of Engineers District Engineer at St. Louis, is trying to work out with the Missouri River Division Chief a plan for keeping the river stage at St. Louis at a point not lower than minus 7.0 during the emergency, so that a power "brownout" can be prevented in that area.

The engineer plan involves an arrangement under which 6,000 cfs of additional water would be released from a combination of dams in the Upper Mississippi and Upper Missouri. With this flow, Union Electric Co would integrate another 3,000 cfs from the company's Bagnell Dam on the Osage River in central Missouri.

Implementation of the plan, which would give St. Louis another 9,000 cfs, involves not only the Corps of Engineers but also the Coordinating Committee on Missouri Basin Reservoir Control, a body composed of state governors or their representatives and federal agencies concerned with the Missouri basin.

In another approach to the problem, the Mississippi Valley Association is pressing for diversion of more water from Lake Michigan into the Illinois waterway than the 1,500 cfs now authorized by the U. S. government. The association holds Lake Michigan is the only available source of substantial increases for the middle Mississippi in the emergency.

Low water already has severely hampered barge traffic.

Democrats Vs. Republicans . . .

. . . In Minnesota: Nelsen Losing

Republican Ancher Nelsen, former federal Rural Electrification Administrator, is fighting hard but is losing the battle for the governorship of Minnesota. Even his most enthusiastic adherents see little chance of his upsetting Gov Orville L. Freeman, now seeking a second term as a candidate of the Democratic-Farmer Labor Party.

Any doubts that Nelsen needs a "miracle" to win the governorship is dissipated by a report published Oct. 21 of a usually reliable Minnesota poll conducted by the "Minneapolis Sunday Tribune." In mid-September, Freeman had 51% of eligible voters for him, Nelsen 42%, according to the poll. By Oct. 21, Freeman jumped to 53% and Nelsen maintained the 42% rating.

A private poll, subsidized by pro-Republicans, also shows Nelsen trailing Freeman badly, even though President Eisenhower and Adlai Stevenson are neck-and-neck. In some circles, voters haven't forgotten that he abandoned the Lieutenant Governorship in 1952 to take a federal job. Some resentment still persists.

Nelsen's REA background has helped little in this campaign. The only time that REA entered the current state campaign was in mid-September when Senator Kefauver appeared in Minnesota and blasted Nelsen for advocating REA rate boosts while he was administrator.

Nelsen termed this untrue and followed Kefauver to Worthington, Minn., protesting that the Tennesseean had the facts wrong. Kefauver, in effect, apologized upon ascertaining that the former REA chief had not advocated rate hikes officially. However after leaving the state, Kefauver said his apology came "too fast" because Nelsen, while administrator, apparently had "recommended" rate boosts at a private meeting. The effect of his tussle with Kefauver failed to help Nelsen—as reflected in the latest Minnesota poll.

Nelsen has tried blowing up several issues against Freeman, but failed to draw much blood. One GOP issue involving a Minneapolis labor leader boomeranged. Originally raised by Republican candidates for Attorney General (with Nelsen subsequently picking it up), the issue concerned the conviction and sentencing several decades ago of Walter Cramond, now president of Minneapolis Central Labor Union. At the time, Cramond was a 19-year-old youth involved in a fist fight.

Nelsen: Chases Kefauver

Labor generally is "death" on Nelsen because of his votes against labor measures as a state senator. Nelsen favors Secretary of Agriculture's Benson's farm parity program and Minnesota farmers resent this.

In campaign stops even through normally Republican sectors of Minnesota, Freeman constantly outdraws Nelsen in turnout. Now, in the closing phase of this political season, it appears that a miracle will be required to change Nelsen's almost-certain defeat into victory.

. . . In Indiana: Wickard Losing, Too

The campaign being waged in Indiana by Democrat Claude R. Wickard, former head of the Rural Electrification Administration to beat Republican Senator Homer E. Capehart for reelection to the U. S. Senate has developed into and out-and-out test between principles of the "old New Deal" and Eisenhower-Benson policies on agriculture.

With 98% of Indiana's farms electrified, and with no public power generated in the state, the fact that Wickard formerly headed REA has not been injected into the campaign.

Wickard, also a former Secretary of Agriculture (under Roosevelt), is plugging for high supports. He jabs Ezra Taft Benson frequently.

On the other hand, Capehart is waging an aggressive campaign, advocating enactment of his bill to provide for speeding up research to broaden the uses of farm products—especially by increasing industrial uses of fibers from the farms.

Capehart also upholds the Administration's farm programs and backs the soil bank, with flexible supports on basic commodities. He declares surpluses were created by policies of the Democrats before the Eisenhower Administration took office. He argues against "going back to the policies that got us into the commodity surplus mess."

Main attention in this campaign between the two men is being given to farm issues. Wickard touches only at times on major problems in other fields. Informal polls indicate a Capehart victory.

Wickard: Jabs Benson

Senate Report Called "Absurd"

Leading men in the electrical industry last week leveled fire at a Senate staff report which alleged "deceit" and an attempt at "tremendous concentration of economic power" in connection with the proposed merger last year of two Northwest electric companies.

The report, deliberately made public during the closing days of the election campaigns, grew out of hearings in September of last year by the Senate anti-monopoly subcommittee. The hearings dealt with the attempted merger of Puget Sound Power & Light Co into the Washington Water Power Co. The merger had been considered after Puget Sound P&L had offered to sell out to public utility districts in the State of Washington.

The ire of the industry men was stirred by a series of charges contained in the staff report which cast doubt as to the propriety and legality of negotiations surrounding the merger. As released by Chairman Joseph O'Mahoney (D-Wyo.) last week, the report:

- Charged Wall Street brokerage firms with a consistent policy of deceit.
- Accused Washington Water Power of attempting to block the sale of Puget Sound to PUD's in order to retard the spread of public power.
- Accused Electric Bond & Share Co and Ebasco Services of having played a leading role in the merger with the objective of enhancing their influence in an important power producing area of the country.
- Questioned whether the Holding Company Act permits holding companies such as Bond & Share to maintain control over operating companies.

Report Accuses . . .

The report says that the stock merger of the two companies would have resulted in a "tremendous concentration of economic power." The report says it represented the type of "dangerous concentration which poses a constant threat to the public welfare."

It found further, that this development "would have strengthened the position of private power interests in the fight against the expansion of public power in the Northwest."

The report continued:

"Unwilling to surrender the control it exercised over local production and distribution of electric energy through subsidiaries, Bond & Share continued to exert influence in the northwest area through Ebasco despite divestiture of subholding companies by order of the SEC."

O'Mahoney said of the report:

"The facts . . . show how a group of Wall Street brokerage and investment houses, and private utility interests, including the Electric Bond & Share Co, and its subsidiary, Ebasco Services, Inc., attempted to force a merger of two utility companies . . . their principal device was a so-called 'stockholders' committee set up in New York City allegedly to represent the owners of the Puget Co of Seattle but actually representing only the Wall Street promoters of the merger. Brokerage firms and investment houses comprised this committee although only a few of them owned any stock in Puget."

Industry Leaders Fire Back

Kinsey M. Robinson, president, Washington Water Power Co: "The O'Mahoney hearing and this report have all the earmarks of a carefully developed plot to undermine public confidence in private capital and private management. It was political to start with, and its release at this time proves it even more political.

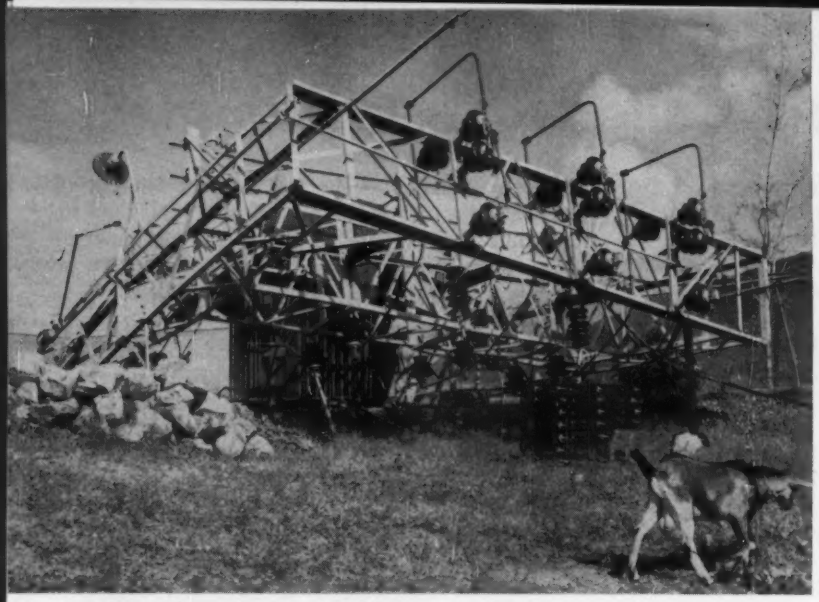
"In this report O'Mahoney again ignores the fact that the Puget-Washington merger had been carefully gone over and was approved by the Washington Public Service Commission as in the public interest. He ignores the fact that witnesses under oath testified that Electric Bond & Share Co had nothing to do with the merger and that Ebasco acted only as consultants to Washington Water Power on request. . . . He ignores the fact that this proposed merger, in spite of the fact that it would have been of tremendous benefit to the Pacific Northwest, was respectfully buried many months ago with all parties attending the funeral. He ignores the normal workings of our American business system to twist an ordinary business transaction into something sinister and evil. He ignores the fact that witnesses testified that the Washington Water Power Co proposed the merger only after Puget Sound P&L had announced its intention to sell out."

George G. Walker, president, Electric Bond & Share Co: "There is not the slightest truth in the staff report . . . that Electric Bond & Share sought to promote the proposed—but never consummated—merger of two Washington State electric utilities."

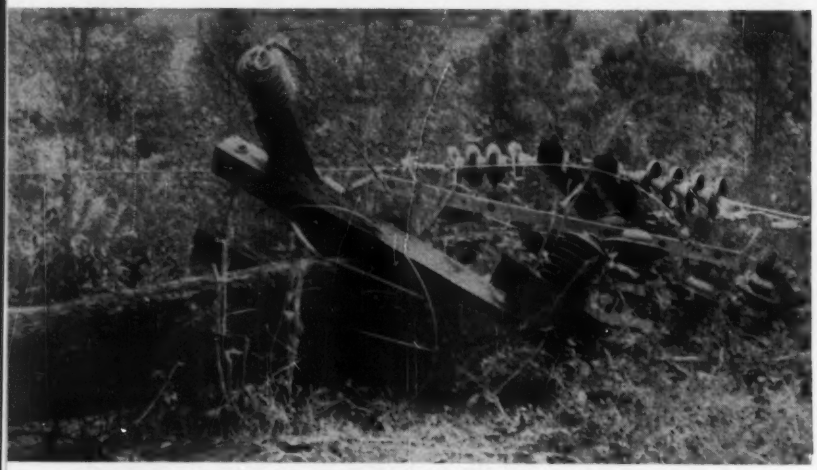
"To claim that Bond & Share or its engineering and business-consulting subsidiary, Ebasco Services, Inc, sought to merge the two companies is simply contrary to all the facts. . . . Neither Bond & Share nor Ebasco exercised influence in any way, shape, or form. We deny that any of the activities of Ebasco Services or its representatives were questionable in any respect.

"This (charge that Ebasco on behalf of Bond & Share sought to dominate Northwest utilities) is ridiculous and absurd. Ebasco is a service organization supplying a growing list of clients with expert business, consulting, engineering, and construction services. . . . It has no policy-making functions for any of its clients."

Frank McLaughlin, president, Puget Sound Power & Light Co: "The merger has long since been a dead issue and the circumstances of its birth and demise are a matter of record and best speak for themselves."



Storm knocked out Yabucoa substation . . .



tore down 38 kv transmission lines . . .

played havoc with overhead distribution

Puerto Rico

Hurricane Betsy struck Puerto Rico with full force. The Water Resources Authority, which supplies electric power for the island, had a rehabilitation plan in readiness. Here, from the Authority's Public Relations Officer G. Navarro Fuentes, is a first-hand account of how the plan worked:

The storm was moderate in intensity with wind velocities ranging from 90 to 110 miles per hour and of relatively small radius. It entered Puerto Rico near Maunabo and Yabucoa in the Southeast and traveled diagonally across the island to make its exit from the Northwest coast. Many areas outside the direct path of the hurricane felt the effect of high winds.

The center of the storm followed a path about 20 miles wide where much of the serious damage was concentrated (see map facing page).

In accordance with the Authority's plan, electric service was suspended when the wind reached its height at 9 AM Aug. 12. As soon as the storm passed, the job of restitution of service began.

No damage was experienced in any of the 24 power plants. Only two distribution substations were damaged. The steel structure of the Yabucoa substation (see cut) was bent to the ground by the wind pressure damaging the lightning arresters, air disconnects, buses, and breaking the bushings of the 38/4.16 kv power transformers. At the Comerio distribution substation a complete set of coils in the high and low tension sides of the power transformers were burned out due to a short circuit. The Authority's two mobile substations were moved to these sites and placed in operation to take over the duty of the damaged equipment.

The Authority's transmission system consists of an integrated network of 115 kv and 38 kv transmission lines which interconnect the hydro and steam electric generating plants and deliver power to the 76 municipal areas into which the island is divided. The transmission lines suffered damage in small sections due primarily

Utility Digs Out After Hurricane

to trees, branches, and debris falling upon the conductors and structures (see cut). Although relatively small in terms of overall cost, this damage was sufficient to prevent integration of the power system following the storm.

Damage to the overhead distribution system was much more extensive throughout the island. The primary distribution lines, largely 4.16 kv, relatively closely spaced, and routed along city streets, highways, and rural trails, were more susceptible to the impact of falling trees (see cut).

Aerial surveys were used to determine the extent of the damage. Based on these, the Authority put into effect its previously adopted rehabilitation plan. Main points of the plan:

1. Reintegration of the transmission system to be started as soon as conditions permit and to be continued without interruption on top priority basis while other functions are underway.

2. Repairs to be made to the shortest and least affected transmission lines, transmitting the power from the various plants to urban load centers, by local repair crews.

3. Restitution of service in urban areas.

4. Restitution of service in rural areas.

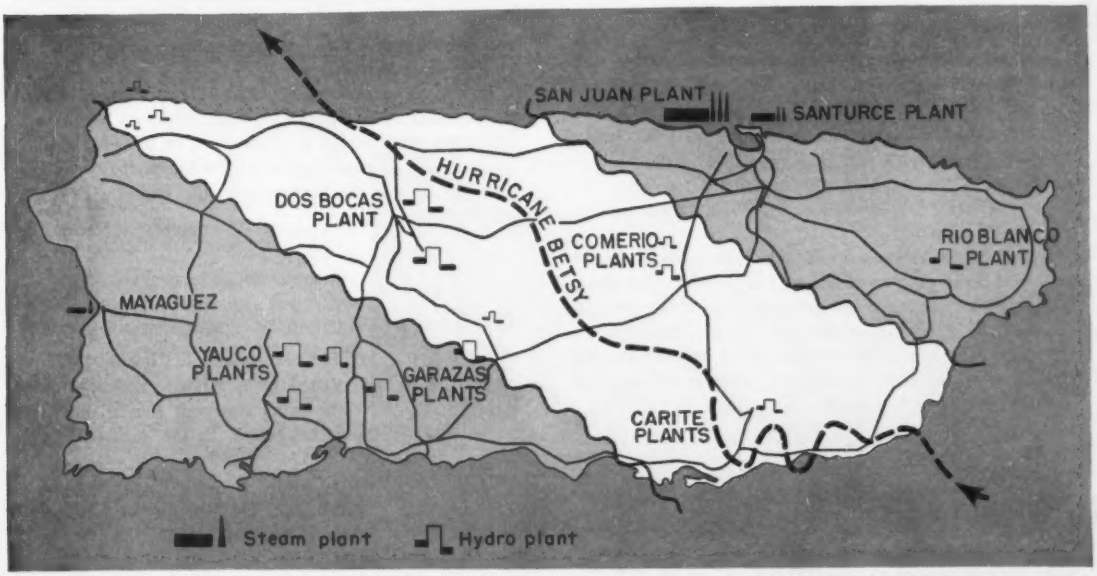
In restoring service to urban areas, energy was first delivered from the nearest power plant to the distribution substation by repairing one of the 38 kv transmission lines and energizing the substation. An inspection was made of each main distribution feeder extending from the substation. Minor damage was repaired and damaged feeder taps, which would require a relatively large expenditure of manpower, were isolated. Trunk feeders were thus energized serving the largest possible number of consumers in the shortest time. An investigation was then made of the isolated taps already repaired and service restored to these heavily damaged sections.

Then secondary 115-230 volts circuits were inspected and service restored to individual premises which had been out of service because of damaged service facilities. In extending service within urban zones, preference was given to hospitals, Red Cross, Civil Defense, water supply, and other essential community services, even in advance of the completion of the general procedure outlined.

Next, repairs of damage to the rural distribution feeders were begun systematically. Preference was given to rural water supply, health offices, dairy farms and industry. By Sept. 7, the only remaining unserved homes were those not occupied or those with badly damaged inside wiring.

Of the total of 76 cities and towns affected, 18 received electric service by the end of the day of the storm, Aug. 12; the number receiving service at the end of the second day, Aug. 13, reached 43; third day, 58; fourth day, 70; fifth day, essentially all urban zones.

The Authority's record of system peak demand and energy production provides a graphic picture of the speed with which normal use of electricity was restored to industry, commerce, and homes throughout the island. On Aug. 28—16 days after Betsy—the Authority established the highest system peak demand in its history. The maximum 60 minute demand on that date was 216,000 kw.



PATH OF HURRICANE cut through center of island hitting two major substations and causing widespread damage to transmission and distribution lines. Urban service was restored in four days, but full restoration required 26 days

Fiery Tempers Flare Again

Fiery tempers flared anew in Detroit Oct. 20 as three labor unions filed motions with the Atomic Energy Commission to halt all construction now underway on the $54.5-million nuclear power station being built by Power Reactor Development Corp in Monroe County.

More than $1 million already has been spent on the project. To date, the 10-acre marshland site has been filled with rock, some concrete has been poured, a railroad right-of-way has been built, and a 100-ft weather tower has been erected.

Atomic Substations?

Small atomic power plants may replace distribution substations 15 to 20 years hence, in the opinion of Dr John Grebe, director of nuclear and basic research at Dow Chemical Co, Midland, Mich. Dr Grebe said the plants might run virtually unattended.

He points out that transmitting power from large central stations costs about as much as generating it. In view of extra transmitting capacity that will be required to meet future loads, it probably will be more economic to triple power capacity with local nuclear plants tied into the system, he predicts. Such plants could be air-cooled, he said, and could capitalize upon their waste heat by supplying industries in a 1-mi radius with heat energy for refrigeration, space heating, and industrial processes.

Co-op Taxes Get the Eye

A drive to impose the same tax laws on co-ops that apply to corporations is being led by a dozen trade associations and the National Tax Equality Association. The contention is that co-ops should pay taxes on money returned to members just as corporations pay taxes on dividends to stockholders. Co-op rebates currently are tax-free. Presumably electric co-ops would form part of the drive's target.

However co-op spokesmen argue that taxes should be levied upon persons receiving the rebates. "No business anywhere is taxed on refunds to customers," said Jerry Voorhis, executive director of the Cooperative League of the USA. "Premiums (and) trading stamps . . . are not subject to income tax. They want to put a penalty on co-ops," he said.

The Rains Came

Bonneville Power Administration will restore normal hydroelectric service to 200,000 kw of interruptible industrial loads Nov. 1. A series of storms swept the Pacific Northwest in mid-October, dumping heavy rains in western Washington and British Columbia and moderate amounts in the Columbia Basin above Grand Coulee, and in the Snake River Basin. BPA had curtailed 500,000 kw of normal interruptible service to 17 electro-process chemical, smelting, paper, and pulp industries Oct. 1 because of critically low river flows. But other power sources were tapped to compensate this.

Weep No More . . .

Residents in the Pacific Northwest will have no cause to weep over eroded banks of rivers and reservoirs if all goes according to theory. The Bureau of Reclamation said in Spokane, Wash., that it plans to plant willow trees to stop this kind of waste. The Columbia Basin Interagency Committee has reported that willow trees are "quite promising" as erosion arresters. The Bureau's extensive planting program will run several years.

Ike and the Hoover Report

From Washington comes this report on what the Eisenhower Administration is doing about Hoover Commission recommendations on federal natural resources and power policy:

It has accepted the Commission's recommendations that the government stop building steam plants and meet needs by interconnecting with neighboring utilities, and that private enterprise be allowed to contribute money to power phases of multipurpose projects.

It now is waiting (possibly for reconvening of Congress) before urging that Southeastern and Southwestern Power Administrations be incorporated, and that they and Tennessee Valley Authority meet financial needs by issuing securities.

It still is reviewing recommendations that federal power rates be boosted to permit payment of interest and taxes comparable to those paid by private utilities; that utilities be permitted to buy a fair share of federal power; and that the government stop building competitive transmission lines.

Oops!

After a five-day blackout along a Cleveland, Ohio, residential street (caused by a storm), residents were elated that power was being restored. But in one residence, strange things happened. In the words of Mrs. Wilfred Kiley:

"The bulbs were so bright they hurt your eyes. The radio set glowed green. The TV tube glowed white and then went out." Wires smoked in the basement and started a small blaze. Fires broke out in other homes. Then Cleveland Dept. Light & Power discovered that the houses were getting 220 v instead of 110 v and the lights went out again for a while.

Vennard Charges U.S. Still Encroaches

EEI vice president tells PEA at Pittsburgh meeting that 'discriminatory laws still plague industry; W. H. Sammis urges utility program to hammer home tax law inequities

Government encroachment is the electric industry's most serious problem, Edwin Vennard, vice president, Edison Electric Institute, recently told the Pennsylvania Electric Association at its 49th annual meeting at Pittsburgh.

More projects are proposed or authorized today to boost the capacity of government-owned facilities to 55 million kw, Vennard said, despite the fact that the industry, through good engineering, met power demands even in war and financed its own $25-billion plant without government aid. He cited these reasons for the continuation of federal power:

1. The courts refuse to hear utilities' pleas for relief from laws written when tighter control of utilities appeared proper although today the laws exceed constitutional authority.

2. Federal money is given to Tennessee Valley Authority for steam plants and is loaned to other public groups at below-market rates.

3. Laws exempt public power from taxes which utility customers must pay at the rate of 23¢ per dollar for electric service.

4. The preference clause gives a privileged group first call on subsidized power.

5. Tennessee gets government power below cost, and this, plus tax relief and cheap money, gives the state power rates about half those charged by utility companies.

These laws, said Vennard, will be changed only when the people demand the change. He noted that only 5% of the people, according to surveys, know about the preference clause. When told about it, 72% of company and 76% of co-op customers expressed disapproval.

Expanding Vennard's views, W. H. Sammis, president, Ohio Edison Co, pointed out that federal power capacity in 1956 was almost 15% of the industry's total today, an increase from less than 1% in 25 years. Only prompt factual testimony of utility representatives, he said, saved the industry from the Gore-Holifield "crash" program of government-owned nuclear power plants.

The industry, Sammis said, needs a program to hammer home the unfairness of tax exemptions and monetary concessions for government projects. The program should stress that the preference clause discriminates against the 80% of the people using private-enterprise power.

"You can make its job easier by fully advising your friends and neighbors how the great majority will benefit from a fair and proper solution," Sammis declared.

Public-power supporters met defeat when Congress passed the Atomic Energy Act of 1954, said Rep W. Sterling Cole (R.-N.Y.). Noting that they continue seeking socialization of the electric business by devious routes, Cole said that such supporters today are shifting to nuclear power as an opportunity to extend the federal role in electric generation and distribution.

The industry today must solve the technological, managerial, and financial problems of nuclear fuel depletion, he said. It must examine all the technical problems, even while looking beyond projects of direct concern to take account of international obligations and the total national effort. The Joint Committee on Atomic Energy would welcome such effort, and the AEC would cooperate in every way.

Low power rates are essential to industrial growth, declared Gov George M. Leader of Pennsylvania. He praised the state's utilities for their area development contribution to replacing employment lost through

(*Continued on page* 155)

G. L. Johnston, South Penn Power; and E. L. Johnston, North Penn Power; hold safety awards for companies in their size groups as K. C. Cregar, Metropolitan Edison; receives PEA Pres O. E. Flora's commendation for lowest accident rate among Pennsylvania utilities. Meco's accident frequency of 2.272 per million manhours was less than 50% of the state rate and 30% of the national rate

CHARLES F. KETTERING, second from left, gets first Charles F. Kettering Award. Others shown are, left to right, E. G. Bailey, chairman, Bailey Meter Co; D. P. Barnard, chairman of award committee; and Dean A. A. Potter, Purdue

AIEE Finds Computer Timely Tool

Fall General Meeting at Chicago finds computers offer relief from growing engineer shortage and alleviate problems created by growing complexity of utility systems. Application to apparatus design is seen as bringing better equipment performance and lower costs

Conclusions reached in other areas of utility system progress, examined at Chicago sessions, were these:

- Excitation system response and transient performance examined in attempt to set definitions and methods of test
- Comparison shows large turbine generator auxiliaries best served through two buses with 4-kv 350-Mva breakers
- New aluminum and lead-alloy cable sheaths for power cable bring benefits in creep, bending, and corrosion performance
- Capacitive switching data needs classification and study
- Guides formulated for application of arresters to generators and cable connected equipment

Application of computers to solution of utility system engineering and apparatus design problems was virtually a run-away subject at the Fall General meeting of AIEE, at Chicago, Oct. 1-5. But interest and attendance at the sessions on computers fully justified their dominence of the program.

Further justification was found in observations by several speakers that digital computers were emerging as a tool for solving system problems coincident with a sharp upturn in the complexity of utility engineering, the shortage of engineers, and the cry that engineers are being "Worked too hard." Many discussers saw computers as alleviating most of these situations.

General questions on the nature and application of computers were answered by a panel of experts. The questions were far more concerned with the nature and use of computers than with their specialized application.

Among the general observations of panel members were these:

E. L. Harder, Westinghouse Electric Corp—Among the bothersome problems in the application of digital computers are: solving small problems on big computers, reducing programming costs, finding ways to use large and small computers in combination, and plotting computer results.

C. G. Veinott, Reliance Electric & Engineering Co—The objective of a computer should be to assist engineers and not replace them. Therefore, the aim should be to make computers palatable to engineers.

A. C. White, General Electric Co—Benefits of computors are two—**1.** The engineers do a better design job because they can explore design possibilities to better advantage with the computer, and **2.** The computer opens up new developmental methods.

Verner Kempinen, General Electric Co—Many problems are being tackled today with computers that previously went untouched because of their mathematical complexities. As a result engineers are now able to do a more fundamental and more detailed work resulting in a better lower cost product.

R. M. Saunders, University of California—It is not difficult for an ordinary man to become expert in digital computers. Many simple problems can be solved on accounting-type computers of the 604 type, but larger memory machines are generally necessary for engineering work.

C. G. Veinott, Reliance Electric & Engineering Co—Probably no single development within recent years offers the promise of contributing so much to advancing the design of electric machinery as modern computers.

Evidence that digital computers are being used on utility problems was seen in two symposiums embracing eight papers sponsored by the Committee on System Engineering and the Committee on Computing Devices.

Problems that never would have been attacked can now be solved by digital computers, F. J. Maginniss, General Electric, said. He urged utilities to start training personnel in computer application "against the time when your organization can justify a computer."

"Any engineer can become fairly proficient in programming in a few months," E. L. Harder, Westinghouse, told the symposium. However, any staff of mathematicians and computer technicians will need system operating engineers to organize problem solutions. When these engineers understand computers and programming, they will solve utility problems more effectively.

J. B. Ward, Purdue University, described programming of engineering problems as the task of translating instructions into a language which can be interpreted by the circuitry of the computer. It is the code that causes certain arithmetic and logical operations to take place within the machine.

Application of computers to three important types of utility system problems were discussed in detail. P. L. Dandeno, Ontario Hydro-Electric Power Commission, described coordination of generation on a three-source system using a card program calculator.

Solution of power system stability problems by means of digital computers was discussed by D. L. Johnson, University of Washington, and J. B. Ward, Purdue University.

Digital calculation of short circuit currents in large complex impedence of networks was described by L. W. Coombe, Detroit Edison, and E. G. Lewis, General Electric. The authors said that a digital has a number of advantages over the use of an analog or network unit. Most short-circuit studies are now performed on ac network analyzers with only reactance represented.

The authors have programmed a method employing both reactance and resistance for the Type 650 digital computer that is now memory limited to a system of 100 buses and 160 lines. Digital calculation of short circuit currents, they said, is feasible and economically justifiable in many cases. Eventually it will be possible to calculate detriment curves by means of computers and to work out circuit breaker schedules for an entire system in this manner.

"The principal objective of computers," E. R. Moore, Detroit Edison Co, said "is not to reduce engineering manpower but to use engineers more effectively in achieving more economical operation and expansion." In commenting on types of engineering organizations for computer use, Moore said Detroit Edison prefers a centralized group responsible for the operation and maintenance of the machine and for establishing separate groups to handle planning and programming.

Exciter and Auxiliary Systems Studied

- **Definition and determination of excitation system response draws wide differences in views**
- **In-service testing of exciter response urged by user. Ontario Hydro tried and found test safe**
- **Cross compound units with twin generators of equal speed seen offering economies in station design**

An "industry hearing," dealing primarily with definition of excitations system response and transient performance, was presented by the Committee on Power Generation. The issue under discussion was the manner of measuring and defining the response of an excitation system.

Four different points of view were represented among the papers heard.

H. W. Corey and W. H. Eagan, Allis Chalmers Manufacturing Co, took the general position that determination of excitations system response is largely a matter of calculation rather than measurement and test.

M. Temoshok and F. S. Roth, General Electric, adhered to the component approach with the segregation of excitation system components maintained and with the previously established concepts and bench marks of performance similarly maintained.

R. W. Ferguson and T. J. Bliss, Westinghouse, outlined eight tests to establish excitation system transient performance but concluded that a combined test of the exciter and regulator and of associated circuitry was perhaps the most practicable.

P. L. Dandeno and K. R. McClymont, Ontario Hydro-Electric Power Commission representing user viewpoint urged that definition of excitation system response be based on measurement of the magnitude of the response by actual tests of the entire excitation system in actual service. They proposed that a volt-time build-up curve of the exciter be determined by establishing conditions stimulating a sudden sustained drop in generator terminal voltage with the exciter at rated speed and connected to

the generator field, with the exciter voltage initially equal to the normal collector ring voltage.

They suggested that excitation system response be the slope in volts per second of a straight-line voltage time curve which begins at nominal collector-ring voltage and continues for half a second. Widespread approval of the Dandeno-McClymont proposal of in-service testing and definition of excitation system response was presented by a chain of utility industry discussers, most of whom approved the method but questioned whether utility operating management would authorize tests of this type which they felt might jeopardize service.

A comparison of auxiliary system arrangements for turbine-generators of 200 to 600 Ma using steam at pressures of 2,000, 3,500, and 4,500 psig was presented by A. C. Dolbec, J. J. Heagerty, and A. G. Mellor of General Electric. Based on estimated costs using proposed 4.16-kv breakers rated 350-Mva interrupting capacity and 80,000-amp momentary capacity, the authors concluded that costs of a two-bus system using such a breaker is about a stand-off with a four-bus system using 4.16-kv 250-Mva switchgear. They felt it to be more economical to keep the auxiliary system at 4.16 kv—whether by using more buses or by consideration of higher rated 4.16-kv switchgear—than to go to a higher voltage.

Simplicity of station design and operation with cross compound turbogenerator units was emphasized in a paper by P. E. Benner, P. G. Brown, R. C. Buell, and A. G. Mellor, all of General Electric. Authors generally favored 3,600/3,600 rpm cross-compound units with a 50-50 power division between the two shafts by contrast with 3,600/1,800 rpm units. Even power division in the case of 3,600/3,600-units permits duplication of generator bus runs and excitation system. The floor area required and in some cases crane spacing will be less than for a comparable 3,600/1,800 rpm unit. But the authors warned that in the event of accidental trip out or loss of field, resynchronizing should not be attempted.

EXAMINING SAMPLES of aluminum cable sheath are Howard A. Hoover, left, John A. Roebling's Sons Corp; John E. Johnson, Philadelphia Electric Co; K. S. Wyatt, Phelps Dodge Copper Products Corp; and Melville W. Ghen, Duquesne Light

Cable Sheath Developments Find Favor

- **Thin-wall corrugated aluminum sheath cuts losses, reduces stiffness, permits sharper bend radius**
- **Tellurium-lead sheath has superior creep and bend properties. Said to have high corrosion resistance**
- **Underwriters Laboratories tests show need to change NEC to recognize load diversity in loading insulated cable in steel ducts and raceways**

A new spirally corrugated thin-wall aluminum sheath for power cables was described by K. F. Wyatt of Phelps Dodge Copper Products Corp. The new sheath, a German development licensed by Wyatt's firm has a thickness about ½ that of conventional aluminum sheath. Flexibility of the sheath permits the cable to be bent on a radius 5 to 9 times its diameter. Sheath losses are said to be lower and heat radiating surface greater, he said. Present intention is to apply the corrugated sheath to industrial wiring as well as oil and gas-filled power cables.

Upwards of 16 million ft of aluminum sheath cable of all types have been made and installed in Canadian industrial and domestic wiring systems, Philip J. Croft, Canada Wire & Cable, Ltd, told the insulated conductor session. However, its use has yet to be approved for use in the United States by the National Electric Code or Underwriters Laboratories.

In summarizing the properties of tellurium-lead cable sheaths, H. A. Hoover, John A. Roebling Sons Corp, made these points:

1. Tellurium-lead has excellent resistance to creep and bending, superior to copper-bearing lead.
2. It may be extruded over a wide range of temperatures without affecting properties of the finished product.
3. Only slight age hardening is evident.
4. Variation in quench temperature from 300F down to air cooling has little effect on resistance to creep and bending fatigue.
5. Control of quench temperature is easily maintained during extrusion.
6. Bending life remains unaffected by exposure to heat equivalent to that received in the wiping operations.
7. Corrosion resistance shows some superiority over copper bearing lead.

C. T. Hatcher and associates of Consolidated Edison Co said that

some 135,000 ft of the tellurium-lead are in locations on the New York system where bending stress due to load cycling is the greatest. He questioned the author's designation of 400F for 10 minutes as comparable to wiping operations. Hatcher found it too low, suggesting that samples be heated to 500 or 510F.

In summarizing the corrosion control practices in use on the Philadelphia Electric underground system, R. C. DeMarco and J. E. Johnson described a duct anode system that has proved highly successful in fighting anodic corrosion. It is composed of a series of graphite anodes mounted on and connected to an insulated wire at 5 ft intervals. Each of the anode sections is supplied with direct current from a feeder wire. Output of the anode is 20 amp dc or approximately 3 milliamp per foot of duct bank for the largest installation on the system, that is 6,000 ft long.

Heating and mechanical effects of installing insulated conductors in steel raceways were analyzed by a team of four engineers of the Underwriters Laboratories. Results, as reported by M. M. Brandon, K. S. Geiges, L. M. Kline and F. V. Paradise, are expected to have a direct effect on the upcoming revision of the National Electric Code.

Analysis of the data indicates that the following additions to the National Electric Code are appropriate. They will be made available to the code committee.

1. Reduction factors, applicable to NEC Table I for more than nine insulated conductors in steel raceway, should recognize load diversity and be 70% for 10-24 conductors, 60% for 25-42 conductors and 50% for 43 or more.

2. Forty percent raceway fill should be used for all raceways including wireways and auxiliary gutters.

Report Laboratory Tests on EHV Conductors

Smaller conductors are required with bundled conductors for reduction of radio interference from extra high voltage transmission lines to permissible levels, G. E. Adams, General Electric, said in reporting on studies on this subject. Dual 1.25-in. conductor at 400 kv causes less radio interference than single 1.75-in. conductor at 350 kv. At 350 kv the single 1.75-in., dual 1.108-in., and triple 0.783-in. conductors give comparable interference levels, said Adams. At 400 kv a single conductor of 2-in. diam is required to maintain the same interference level as the dual 1.25-in. conductor.

C. J. Miller, Jr, reported radio interference tests on a 1.75-in. diam conductor in the Ohio Brass Co laboratory. The tests were directed at correlating laboratory results and field experience. Special attention was given to the effect of particles in the air impinging on the conductor. Dusting particles of sand, iron, fly ash, silicon carbide, and sulphur on a smooth conductor increased the corona discharge and the radio interference level. It was concluded that air borne particles may explain the difference between laboratory results and those obtained in line tests in the field.

Current status of load-frequency control, methods, and equipment used by electric utilities was reported by the System Control Subcommittee of the System Engineering Committee.

An analysis of 138 replies from 173 operating companies, systems, and interconnected groups showed 72 companies had load frequently control in operation. Sixty-seven of these normally operate in parallel on the various interconnections.

These conclusions were drawn:

1. A trend towards centralization of operating information is well under way.

2. Extensive use is being made of telemetering equipment to accomodate this centralization.

3. Metering signals are being transmitted an average maximum distance of 101 miles with the maximum reported distance 400 miles.

4. Carrier current was second to telephone lines as the preferred channel for telemetering.

5. Interconnected system operation is tending toward tie line bias control.

(*Continued on page* 164)

Arrester Application Examined

When should lightning protective equipment be provided at generator terminals, in addition to arrester protection at line terminals outside the station? A theoretical method for making a determination was presented in a paper by A. P. Hayward and J. K. Dillard of Duquesne Light Co and A. R. Hileman of Westinghouse. Equivalent circuits were established for determining transferred surge voltage. Validity of these circuits was demonstrated by field tests and checked by the Anacom.

No Arresters at Terminals

In the discussion of this paper some reported that they were installing unit-connected generators without added protection at the generator terminals. Others felt that the cost of the added protection was a nominal amount compared to generator cost and therefore the added protection should be provided.

Tests on the application of expulsion arresters on cable connected equipment were reported in a paper by C. J. Baldwin, Jr. and J. M. Clayton of Westinghouse. Presentation was by Clayton. Results were related to length of arrester lead, length of cable, and surge impedance of the cable. Conclusions were that the shorter the arrester lead the better. Cable attenuation helps reduce the surge voltage on equipment. Protection is required at the equipment end of the cable for medium length cables and not for very short cables, up to 300 ft, or long cables, over 3,100 ft.

Arrester Stops Power Follow

A. C. Westrom of Hubbard & Co described an expulsion type arrester which, he said, allowed no power follow current. Several discussers pointed out that the test conditions described did not conform to industry standards set up for arrester tests. E. H. Yonkers of Joslyn Mfg Co said that the tests did not evaluate all of the significant variables and did not prove anthing. H. A. Cornelius of the Commonwealth Edison Co said that additional information was needed in order to evaluate the test results.

F. V. Cunningham of Line Material Co said that surge current does not always initiate power follow current but once the autogap arrester, described by Westrom, has passed power follow current it will continue to do so on each successive discharge. He said that this type of arrester does not have the capacity to pass power follow current.

Transformer Loading Computed

DISTRIBUTION
Testing

Kentucky Power Co develops calculations giving results deviating little from those obtained with clamp-on-meter

O. O. HENDERSON, District Supervising Engineer, Kentucky Power Co, Ashland, Ky.

Calculations based on consumers' meter readings give Kentucky Power Co what it regards as fairly accurate measurements of distribution transformer demands. Experience with these calculations indicate that:

1. Load on specific transformers can be calculated.

2. Bad secondary voltage situations or questionable spots that should be checked with a meter are indicated.

3. Overloads can be detected at locations often missed when the customary thermal ammeter tests are used alone, such as public buildings having occasional evening meetings.

4. Continuous load check is feasible at relatively small expense, making estimates of load growth superfluous.

5. The method is adaptable to any arrangement of additional transformers.

6. Replacement of transformers can be based on calculated loads and a replacement chart.

7. It is applicable to rural and urban territory although the greater congestion on urban poles may call for field trips to assure that telephone facilities will not interfere.

8. Time required is only 5 to 10 min per transformer to set up the record file.

9. The method permits office determination of necessary distribution-system changes in rural territory without field trips.

The calculations involve data based on a large number of customers, their division into classes, season of maximum demand, and correction factors to the kwhr readings. Application of the method, however, is limited to 25-kva and smaller transformers until sufficient data on larger sizes are obtained.

For years clamp-type thermal ammeters were used to determine loading on distribution transformers. But the cost became prohibitive as rural transformers increased in number. Average time per check was 1 hr when two men installed and removed the meter, and at this rate frequent load checks to keep abreast of system growth were too expensive.

Seeking a substitute, Kentucky Power tried recording customers' major appliances to estimate possible increase in transformer loading between tests. This proved time consuming. Moreover, as appliances were added and customers moved, too many errors arose.

As a starting point in developing its new method, the company used data from the Oct. 1948 GE Distribution Data Book (p 59, Fig 38) and analyzed more than 2,000 actual readings of demand and corresponding kwhr consumption from commercial accounts.

Having developed the method, the company compared its results with actual demands on transformers tested with a clamp-on thermal ammeter. Deviations are plotted in Fig 1. This chart, covering 1,722 customers served by 88 transformers, each feeding 2 to 68 customers, indicates that 77% of the calculated loads were within ±2 kw of the ammeter reading. About half of these cases were within ±1 kw. Of all calculated loads, 22% were more than 2 kw higher than ammeter readings, and about half of these more than 3 kw higher. Only 1% was more than 2 kw low.

Deviation Small

With three exceptions, calculated loads that tested more than 17 kw deviated less than ±2 kw from ammeter readings despite the fact that the proportions of Class A, B, C, D, and commercial customers on each transformer varied. For example, in a case where calculated and test loads (18.4 kw) agreed, eight customers were involved. Four were Class B, three Class C, and one was a small commercial customer.

In another case of agreement involving 38 customers with a load of 30.2 kw, 16 (42%) were Class B, 11 (29%) Class A, seven (18%) Class C, two (5%) Class D, and two small commercial customers. Largest departure of calculated from test load—47.5 kw—involved 13 customers: five (39%) Class B, three (23%) each Class A and C, one Class D, and one commercial.

Departures were much smaller

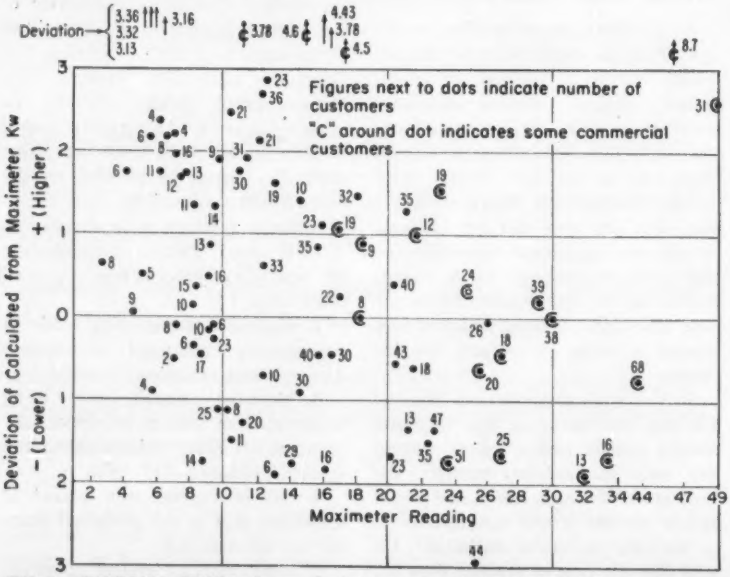


FIG 1—SHOTGUN CHART shows deviations of calculated loads from clamp-on thermal ammeter kw for 1,722 users on 88 transformers each with 2 to 68 users

from Customers' Kwhr Use

BOOK NO. _____ Ⓑ MAP NO. _____
DATE _____ SERIES _____

POLE NO.	A	B	C	D	COMM.	POLE NO.	A	B	C	D	COMM.
1						51					
2						52					
3						53					

Account Changes From Bi-Monthly Meter Book Ⓒ Book No. Date

Pole No.	New Account KWH	Days Used	EXISTING ACCOUNT					
			Past KWH	New KWH	RO.	RI.	Disc.	Rem.

Account Changes Monthly Demand Meter Book Ⓓ Book No. _____ Date _____

Pole No.	Meter No.	New Account Demand	EXISTING ACCOUNT					
			Past Demand	New Demand	RO.	RI.	Disc.	Rem.

FORMS used in preparing data for calculating transformer load from customers' kwhr data. Number of each class of customer is identified by pole and map number. Account changes are posted whenever meter books are checked

than expected. Accuracy of calculations on rural transformers has now reached such a degree that the method is being extended to urban districts.

Completing transformer load records, including postings from meter books, and calculating loads take about 5 min for each rural and 10 min for each urban transformer. In the Ashland District, where a continuous load check is maintained by the method, only an estimated 4 min are required annually per transformer.

Basic requirements of the method are that meter books contain the service pole number of each particular account and that maps show the secondaries served by each transformer. Accordingly, separate cards are now made for each transformer, showing transformer pole number and kva size. From maps, pole numbers and secondaries served from particular transformers are transcribed to the cards. Each account is posted from the meter books to a sheet and classified according to this schedule:

Class	Bimonthly use in Kwhr
A	0-200
B	200-400
C	400-800
D	800-1,600
Commercial	1,600 up

After all meter books referring to a particular map section are posted (commercial accounts with demand meters included), postings are transferred to transformer load cards. These are in pencil to facilitate changes. After these postings, load can be calculated.

Continuous loading on each transformer is maintained by checking each meter book after it is read. Information on changes in existing accounts or addition of new accounts is obtained by telephone operators at

901-5599 MAR 1954 KVA

POLE	A	B	C	D	COMM	DEMAND
- 5533			1			~~22 3/54~~
- 5532	1	1	2			26.1 3/55
- 5531	3	1				
- 5530	1	1	1			
- 5529		1	2		5.2	
- 5598						
- 5528	1					
- 5527	1	2	1	1		
- 5526	1		1		5.5; 6.4	

TRANSFORMER LOAD CARD shows kva rating, poles, number of each class of customer served, the commercial customers' and calculated transformer demands

Conversion Tables for Calculations of Transformer Loads

Applicable to single-phase transformers when calculating kw demands from meter-book reading.

TABLE A—Total No. B & C & D & Comm. Customers

A Cust.	0	1	2	3	4	5	6	7	8	9	10	OVER 10
1	.7	.4	.3	.3	.3	.2	.2	.2	.2	.2	.1	
2	1.1	.7	.6	.6	.5	.4	.4	.4	.4	.3	.2	
3	1.4	1.0	.9	.8	.7	.6	.6	.6	.5	.4	.3	Add
4	1.7	1.3	1.1	1.0	.9	.8	.8	.7	.6	.5	.4	0.1
5	2.0	1.5	1.3	1.2	1.1	1.0	.9	.8	.7	.6	.5	per
6	2.2	1.7	1.5	1.4	1.3	1.1	1.0	.9	.8	.7	.6	Cust-
7	2.4	1.9	1.7	1.6	1.4	1.2	1.1	1.0	.9	.8	.7	omer
8	2.6	2.1	1.9	1.7	1.5	1.3	1.2	1.1	1.0	.9	.8	
9	2.8	2.3	2.0	1.8	1.6	1.4	1.3	1.2	1.1	1.0	.9	
10	3.0	2.4	2.1	1.9	1.7	1.5	1.4	1.3	1.2	1.1	1.0	

OVER 10 — ADD 0.1 FOR EACH ADDITIONAL CUSTOMER

TABLE B—Total No. of C & D & Comm. Customers

B Cust.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 AND OVER
1	1.6	.8	.6	.5	.5	.4	.4	.4	.4	.4	.4	.4	.3	.3	.3	.3	.3	.3	.3	.3	
2	2.4	1.4	1.1	1.0	.9	.8	.8	.8	.8	.8	.8	.7	.6	.6	.6	.6	.6	.6	.6	.5	
3	3.0	1.9	1.6	1.4	1.3	1.2	1.2	1.2	1.2	1.2	1.1	1.0	.9	.9	.9	.9	.9	.9	.8	.7	
4	3.5	2.4	2.0	1.8	1.7	1.6	1.6	1.6	1.6	1.5	1.4	1.3	1.2	1.2	1.2	1.2	1.2	1.1	1.0	.9	Add
5	4.0	2.8	2.4	2.2	2.1	2.0	2.0	2.0	1.9	1.8	1.7	1.6	1.5	1.5	1.5	1.5	1.4	1.3	1.2	1.1	
6	4.4	3.2	2.8	2.6	2.5	2.4	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.8	1.8	1.7	1.6	1.5	1.4	1.3	0.2
7	5.8	3.6	3.2	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.1	2.0	1.9	1.8	1.7	1.6	1.5	
8	6.2	4.0	3.6	3.4	3.3	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	per
9	6.8	4.4	4.0	3.8	3.6	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	
10	7.2	4.8	4.4	4.1	3.9	3.7	3.6	3.5	3.4	3.3	3.2	3.0	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1	Customer
11	7.6	5.2	4.7	4.4	4.2	4.0	3.9	3.8	3.7	3.6	3.4	3.2	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3	
12	8.0	5.5	5.0	4.7	4.5	4.3	4.2	4.1	4.0	3.8	3.6	3.4	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5	
13	8.3	5.8	5.3	5.0	4.8	4.6	4.5	4.4	4.2	4.0	3.8	3.6	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7	
14	8.6	6.1	5.6	5.3	5.1	4.9	4.8	4.6	4.4	4.2	4.0	3.8	3.6	3.5	3.4	3.3	3.2	3.1	3.0	2.9	
15	8.9	6.4	5.9	5.6	5.4	5.2	5.0	4.8	4.6	4.4	4.2	4.0	3.8	3.7	3.6	3.5	3.4	3.3	3.2	3.1	
16	9.2	6.7	6.2	5.9	5.7	5.4	5.2	5.0	4.8	4.6	4.4	4.2	4.0	3.9	3.8	3.7	3.6	3.5	3.4	3.3	
17	9.5	7.0	6.5	6.2	5.9	5.6	5.4	5.2	5.0	4.8	4.6	4.4	4.2	4.1	4.0	3.9	3.8	3.7	3.6	3.5	
18	9.8	7.3	6.8	6.4	6.1	5.8	5.6	5.4	5.2	5.0	4.8	4.6	4.4	4.3	4.2	4.1	4.0	3.9	3.8	3.7	
19	10.1	7.6	7.0	6.6	6.3	6.0	5.8	5.6	5.4	5.2	5.0	4.8	4.6	4.5	4.4	4.3	4.2	4.1	4.0	3.9	
20	10.4	7.8	7.2	6.8	6.5	6.2	6.0	5.8	5.6	5.4	5.2	5.0	4.8	4.7	4.6	4.5	4.4	4.3	4.2	4.1	

OVER 20 — ADD 0.2 FOR EACH ADDITIONAL CUSTOMER.

TABLE C—Total No. D & Comm. Customers

C Cust.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	3.6	1.8	1.5	1.3	1.2	1.1	1.0	.9	.9	.8	.8	.8	.7	.7	.7	.7	.7	.6	.6	.6	.6
2	5.4	3.3	2.8	2.5	2.3	2.1	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.4	1.4	1.4	1.3	1.2	1.2	1.2	1.2
3	6.9	4.6	4.0	3.6	3.3	3.0	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2.1	2.1	2.0	1.9	1.8	1.8	1.8	1.8
4	8.2	5.8	5.1	4.6	4.2	3.9	3.6	3.4	3.3	3.1	3.0	2.9	2.8	2.8	2.7	2.6	2.5	2.4	2.4	2.4	2.4
5	9.4	6.9	6.1	5.5	5.1	4.7	4.4	4.2	4.0	3.8	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3.0	3.0	3.0	2.9
6	10.5	7.9	7.0	6.4	5.9	5.5	5.2	4.9	4.7	4.5	4.4	4.3	4.1	4.0	3.9	3.8	3.7	3.6	3.6	3.5	3.4
7	11.5	8.8	7.9	7.2	6.7	6.3	5.9	5.6	5.4	5.2	5.1	4.9	4.7	4.6	4.5	4.4	4.3	4.2	4.1	4.0	3.9
8	12.4	9.7	8.7	8.0	7.5	7.0	6.6	6.3	6.1	5.9	5.7	5.5	5.3	5.2	5.1	5.0	4.9	4.7	4.6	4.5	4.4
9	13.3	10.5	9.5	8.8	8.2	7.7	7.3	7.0	6.8	6.5	6.3	6.1	5.9	5.8	5.7	5.6	5.4	5.2	5.1	5.0	4.9
10	14.1	11.3	10.3	9.5	8.9	8.4	8.0	7.7	7.4	7.1	6.9	6.7	6.5	6.4	6.3	6.1	5.9	5.7	5.6	5.5	5.4
11	14.8	12.1	11.0	10.2	9.6	9.1	8.7	8.3	8.0	7.7	7.5	7.3	7.1	7.0	6.8	6.6	6.4	6.2	6.1	6.0	5.9
12	15.4	12.8	11.7	10.9	10.3	9.8	9.3	8.9	8.6	8.3	8.1	7.9	7.7	7.5	7.3	7.1	6.9	6.7	6.6	6.5	6.4
13	16.4	13.5	12.4	11.6	11.0	10.4	9.9	9.5	9.2	8.9	8.7	8.5	8.2	8.0	7.8	7.6	7.4	7.2	7.1	7.0	6.9
14	17.	14.2	13.1	12.3	11.6	11.0	10.5	10.1	9.8	9.5	9.3	9.0	8.7	8.5	8.3	8.1	7.9	7.7	7.6	7.5	7.4
15	17.6	14.9	13.8	12.9	12.2	11.6	11.1	10.7	10.4	10.1	9.8	9.5	9.2	9.0	8.8	8.6	8.4	8.2	8.1	8.0	7.9
16	18.4	15.6	14.4	13.5	12.8	12.2	11.7	11.3	11.0	10.6	10.3	10.0	9.7	9.5	9.3	9.1	8.9	8.7	8.6	8.5	8.4
17	19.	16.2	15.0	14.1	13.4	12.8	12.3	11.9	11.5	11.1	10.8	10.5	10.2	10.0	9.8	9.6	9.4	9.2	9.1	9.0	8.9
18	19.6	16.8	15.6	14.7	14.0	13.4	12.9	12.4	12.0	11.6	11.3	11.0	10.7	10.5	10.3	10.1	9.9	9.7	9.6	9.5	9.4
19	20.2	17.4	16.2	15.3	14.6	14.0	13.4	12.9	12.5	12.1	11.8	11.5	11.2	11.0	10.8	10.6	10.4	10.2	10.1	10.0	9.9
20	21.0	18.0	16.8	15.9	15.2	14.5	13.9	13.4	13.0	12.6	12.3	12.0	11.7	11.5	11.3	11.1	10.9	10.7	10.6	10.5	10.4

TABLE D—Total No. Comm. Customers

D Cust.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	4.8	2.4	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.0	1.0	1.0	.9	.9	.9	.9
2	7.2	4.2	3.4	3.1	2.9	2.7	2.5	2.3	2.1	2.0	2.0	1.9	1.8	1.8	1.8	1.8
3	9.0	5.8	4.9	4.5	4.2	3.9	3.6	3.3	3.1	3.0	2.9	2.8	2.7	2.7	2.7	2.6
4	10.6	7.3	6.3	5.8	5.4	5.0	4.6	4.3	4.1	3.9	3.8	3.7	3.6	3.6	3.5	3.4
5	12.1	8.7	7.6	7.0	6.5	6.0	5.6	5.3	5.0	4.8	4.7	4.6	4.5	4.4	4.3	4.2
6	13.5	10.0	8.8	8.1	7.5	7.0	6.6	6.2	5.9	5.7	5.6	5.5	5.3	5.2	5.1	5.0
7	14.8	11.2	9.9	9.1	8.5	8.0	7.5	7.1	6.8	6.6	6.5	6.3	6.1	6.0	5.9	5.8
8	16.0	12.3	10.9	10.1	9.5	8.9	8.4	8.0	7.7	7.5	7.3	7.1	6.9	6.8	6.7	6.6
9	17.1	13.3	11.9	11.1	10.4	9.8	9.3	8.9	8.6	8.3	8.1	7.9	7.7	7.6	7.5	7.4
10	18.1	14.3	12.9	12.0	11.3	10.7	10.2	9.8	9.4	9.1	8.9	8.7	8.5	8.4	8.3	8.1
11	19.1	15.3	13.8	12.9	12.2	11.6	11.1	10.6	10.2	9.9	9.7	9.5	9.3	9.2	9.0	8.8
12	20.1	16.2	14.7	13.8	13.1	12.5	11.9	11.4	11.0	10.7	10.5	10.3	10.1	9.9	9.7	9.5
13	21.0	17.1	15.6	14.7	14.1	13.3	12.7	12.2	11.8	11.5	11.3	11.1	10.8	10.6	10.4	10.2
14	21.9	18.0	16.5	15.6	14.9	14.1	13.5	13.0	12.6	12.3	12.1	11.8	11.5	11.3	11.1	10.9
15	22.8	18.9	17.4	16.4	15.7	14.9	14.3	13.8	13.4	13.1	12.8	12.5	12.2	12.0	11.8	11.6

Table E

1.	1.21
2.	.67
3.	.55
4.	.48
5.	.45
6.	.42
7.	.39
8.	.36
9.	.36
10.	.33
11.	.33
12.	.33
13.	.30
14.	.30
15.	.30

night and sent to the engineering department on two special forms, one for bimonthly meter books (kwhr) and the other for monthly meter books (demand).

Average relation of kw demand to kwhr consumption, based on readings of 2,000 commercial customers using more than 1,600 kwhr bimonthly, is represented by Fig 2. Conversion Table E is used in calculating the contribution of commercial customers to transformer load. Conversion Tables A to D are for calculating the contribution of different combinations of A, B, C, D, and commercial customers to transformer load. They are based on load factor, diversity factor, and power factor of different class loads.

Using the transformer demand card, the following is the procedure for calculating transformer load:

Readings for commercial customers having demand meters are posted on the card. Fig 2 provides the demand to be posted for other commerical and residential customers having only kwhr meters and using 1,600 kwhr or more bimonthly.

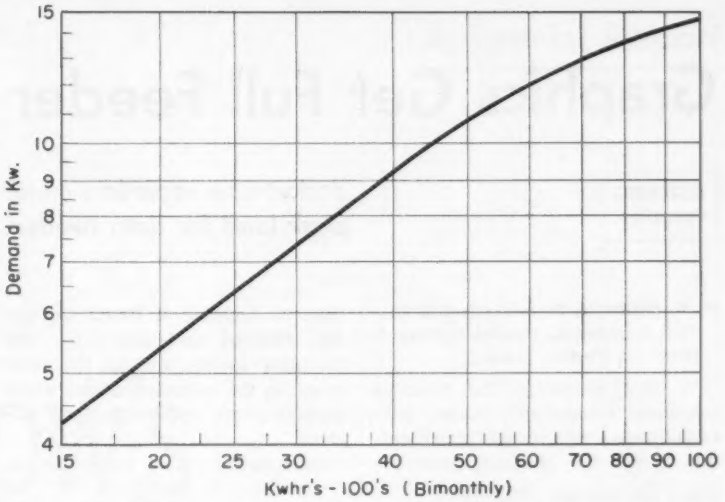


FIG 2—KW DEMAND is related to bimonthly kwhr consumption in this chart based on an analysis of 2,000 customers using 1,600 kwhr or more bimonthly

In determining the portion of transformer load contributed by all commercial customers, customers should be listed in the order of their demands, highest first, and the rankings should be numbered 1, 2, 3, 4, etc. Each customer's demand is then multipled by the factor for its ranking in Table E. For example:

6.4 × 1.21 = 7.8 kw
5.5 × 0.67 = 3.7 kw
5.2 × 0.55 = 2.9 kw

Commercial demand = 14.4 kw

In determining the part of transformer load contributed by all other class customers, the customers are listed in reverse order. Each listing is preceded by the number in each class and followed by the number of higher ranking customers. With the appropriate conversion table, the following results are obtained:

1 D with 3 commercial (see Table D)	1.6
8 C with 4 commercial & D customers (Table C)	7.5
6 B with 12 commercial & C, D customers (Table B)	1.8
8 A with 18 commercial & B, C, D customers (Table A)	0.8
Total A, B, C, D Demand	11.7 kw
Grand Total Demand Including Commercial	26.1 kw

The calculated total demand is entered on the transformer load card. When transformer load rises above the corresponding curve in Fig 3, necessity for correcting conditions is indicated. The charts are used for voltage-drop estimates in the same way as for transformer load, but the result is divided by 0.85.

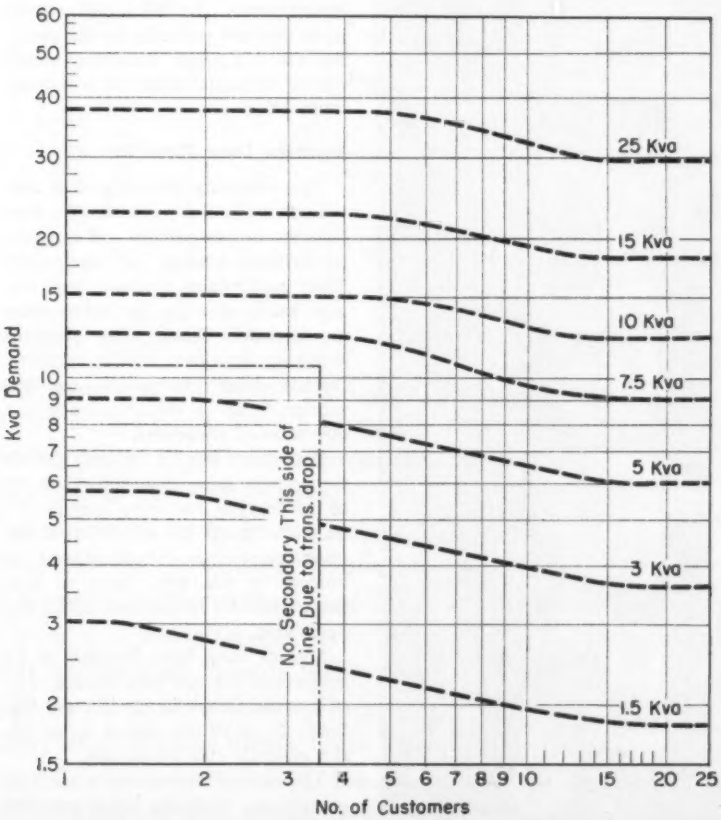


FIG 3—CALCULATED LOAD over transformer load curve for corresponding conditions indicates correction. Curves based on a transformer demand analysis

Graphics Get Full Feeder Load Data

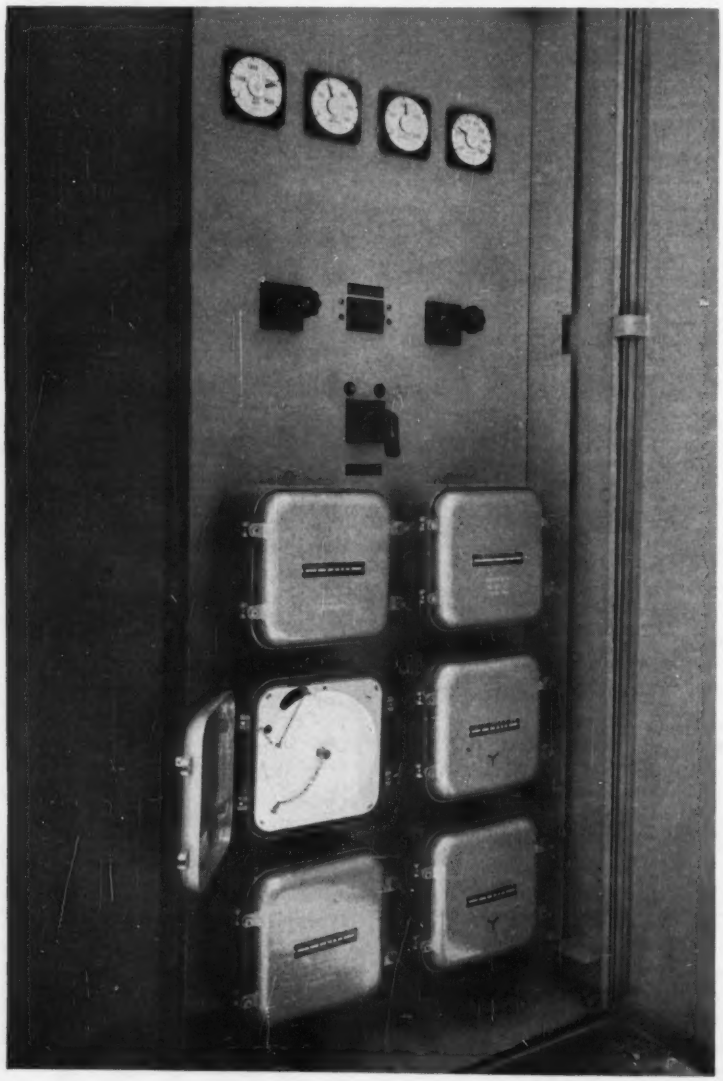
METERING
Operation

Socket-type recorders meter 3 to 4 substations during the peak load for data needed in system planning, operation

W. C. GIERISCH, Superintendent of Electrical Engineering, Houston Lighting & Power Co, Houston, Texas

A new procedure for metering substation feeders supplements indicating meters with socket-type recording meters for obtaining data for Houston Lighting & Power Co system planning and operation. The recording meters are on the same circuit as the indicating meters which measure watts, vars, volts, and amperes.

Information on all feeders is obtained by switching the socket-type recording meters from one to another. The recording meters are then removed from the sockets and installed at another substation. Each set of recording meters includes:



Each Set Has 6 Meters

Three ammeters, one per phase.

One 3-phase wattmeter for the circuit.

One 3-phase varmeter for the circuit.

One single-phase voltmeter.

The sockets are installed on channel iron bases mounted on the wall behind the indicating metering panel in substations with pipe-supported switchboard panels. In metal-clad switchgear, they are mounted on the swinging metering panel. Recording meters can be set in and lifted out with minimum effort.

Reactive Load Data Full

The recording meters give a continuous, 24-hr-a-day record, providing data on the magnitude and duration of critical loading of equipment. Their use obviates expensive load surveys made at night for information on after-dark loads. The program involving their use provides complete reactive load information, an important factor in the installation and operation of capacitors.

Peak loads stay on for long periods through the summer months. One set of socket-type recording meters can be moved from one substation to another, remaining at each a week or longer. In this way, three or four substations can be metered during the peak load.

Sockets have been installed at 15 substations for use with the four sets of graphic meters in service. On this basis, 25 to 30 sets should suffice for the system's 100 substations.

The cost of the meters is small in comparison with the value received by the company from the information which they provide.

A Special Report

How to Cut Tomorrow's Costs

DAVID REA, Southeastern Editor

Cost cutting has long contributed to improving the financial position of utilities, holding the line on rates, and reducing employee requirements per kw. But with the vast expansion of the industry in a time of rapidly rising prices, finding cheaper methods will be of even greater importance to all departments of utilities.

To aid the industry in its quest for outstanding practices, Electrical World has been loading each issue with dollar-saving ideas and will continue to do so. In this special report, however, are 14 articles on new and improved ideas that stem from the ingenuity of cost-cutters throughout the country. Because the originators have found these ideas profitable, the editors believe you may also.

Major articles are listed below. But don't overlook the shorter items; they also offer substantial savings.

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Assembly-Line Methods Bury Cable

Short Bucket Boom Speeds Lamp

HENRY L. ALLEN, Superintendent of Automotive Equipment, Florida Power & Light Co, Miami, Fla.

An aerial bucket modified for changing street lamps on a group replacement basis has been developed by Florida Power & Light Co. Use of the new rig permits spotting the bucket for work at intermediate heights, saves crew time and energy, and increases production.

Major change was the shortening of the lower boom by 5 ft. This permits spotting of the basket over the side of the vehicle when the desired working height is 15 to 20 ft above the ground.

Two other modifications minimize the dimensions of the equipment. By reversing the mounting position of the pedestal the two-section boom, when not in use, projects over the cab of the truck, thus holding down overall length. And the fibre-glass basket was suspended from its top rather than bottom. This arrangement lowers the overall height without need of folding the basket and also gives the operator a greater sense of stability when elevated 31 ft in the air.

Mounting the aerial bucket on a 19,000 GVW chassis eliminates the need for outriggers, thus speeding safe operations.

Two men operate the equipment during the day at a production rate of 125 lamps per shift. Before long, the unit will be operated on a night shift by one man for trouble shooting and street-light patrol. Because of its versatility aerial bucket is ideal for work on crowded corner poles, alley arms, transformer platforms, and midspans.

Development of the modified aerial bucket stems from efforts to obtain a more functional piece of equipment for street-lamp maintenance. The company first used a ladder fastened

in 1/6 the Time

R. K. WOODSON, Asst Supt, Underground Department, Kansas City Power & Light Co, Kansas City, Mo.

Assembly-line methods using a small ditching machine permit Kansas City Power & Light Co to bury street-lighting cable in one-sixth the former time. The machine digs a trench 4½-in. wide and 40-in. deep and has enough reserve power to plow through almost anything except solid rock.

Cable reels are mounted on a backfiller which is attached to the rear of the trencher. The cable or cables are fed down through a tube to the bottom of the ditch. The backfiller consists of two steel scraper blades arranged in an "A" shape but open at the small end approximately the width of the trench. A partial flooring on top of the A-shaped backfiller permits workers to ride the backfiller, weight it down, and feed the cable into the tube that lays it in the trench.

A trailing air compressor assists in compacting the earth and furnishes air to two tampers. Close behind the tamping operation comes the crew placing sod which is purchased for the purpose.

Development of this technique was a slow evolution. At first only the trencher was used. The cable was installed by hand. Backfilling, tamping, and cleaning-up work were done as with heavy power cable. Later, the "A"-shaped backfiller was added, and the cable was laid out on the ground and fed into the trench behind the digging ladder. The air compressor was moved along the street by a truck.

With the assembly-line method less than 10 man-minutes are required to do one manhour's work by the old method.

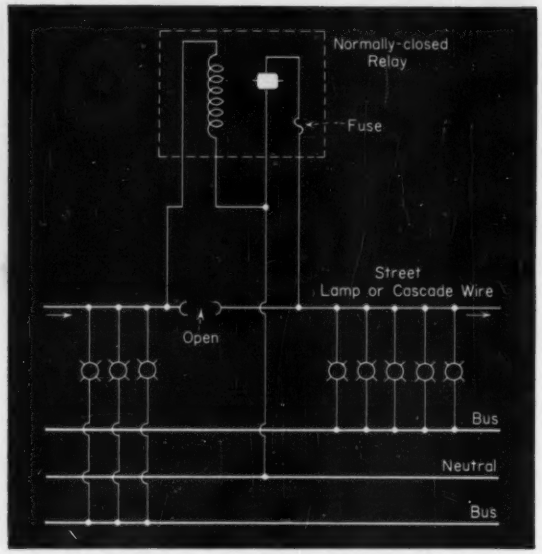
SOD IS PLACED immediately after the ditch is backfilled and tamped. The sod is purchased specially for this purpose

Changing

to the rear of truck. This proved satisfactory in districts having about 300 lights and utilized existing equipment at nominal additional cost. But accurate spotting of ladder was a problem, slowing operations.

Mechanical-operated aerial ladder was then tried. This occupied a large percentage of the truck bed and almost precluded its use for other than emergency or street-light work. Furthermore only 60 lamps could be changed during a shift by two men. By changing this type of ladder to hydraulic operation output was raised to 100 lamps per day; yet the workmen still had to climb the ladder.

Fusing Street Light Relays Saves $600 Yearly



INSTRUMENT CARTRIDGE FUSE rated 250 v, 30 amp protects the mercury contact relay against overload or faults

MILES J. CHAMBERLAIN, Seattle Department of Lighting, Seattle, Wash.

Fusing of street-light control relays against overloads or faults saves about $600 annually for Seattle City Light. Fuses currently are being installed in the contact circuit of the relays of which more than 5,000 are in service on City Light's street lighting control system.

The control relay circuit is a simple cascade type using normally closed mercury-contact relays. These units utilize lamp leakage current in series, through the lamps and the relay coil, to hold contacts open during the day. Overloads or overvoltages incidental to secondary faults or similar line troubles will destroy the mercury relay contacts.

Fuses inserted in the circuit protect the contacts. Fuses are 250-v, 30-amp instrument cartridge type installed in a pressure contact holder in the relay housing. The street-light circuits consist of No. 6 copper wire, on secondary arms, which is connected by relay to the neutral of a standard 120/240-v, single-phase lighting secondary for lamp operation. The circuit is energized at about 120 v during the time of relay control.

Mechanical Sod Cutter Saves $3.70/100 Ft

SOD CUTTER moves at 80 fpm cutting 12 in. wide and up to 2 in. deep. Faster speed is used for moving the machine

C. J. BARTHOLOMEW, Asst Supt, Steam and Conduit Div, Underground Lines Dept, Detroit Edison Co, Detroit, Mich.

Sod cutting machines reduce costs 74% during removal of sod for installation of buried cable and conduit by Detroit Edison Co. Moreover, compared with hand labor, use of the machine provides a cut sod that does not dry out so fast and that is better appearing when replaced. Home owners are better satisfied with end results.

Sod is cut by an oscillating blade, 12-in. wide, that can be adjusted for cuts up to 2-in. deep. The blade is powered by a gasoline engine which also drives the machine. Two speeds are provided: A low speed of 80 fpm is usually used for cutting sod, and a higher speed is used for moving the machine when not cutting.

Sod which is not to be replaced for several days is cut 2-in. thick. This thickness of cut sod does not dry out and deteriorate so quickly as thinner cuts. However, the 2-in. thick cuts cannot be rolled but must be taken out in 1-ft lengths. Sod which is to be replaced the same day is cut about 1-in. thick and rolled in lengths of 6-ft.

Cost of removing sod for 100 ft of trench is about $1.30. Removal of same quantity by hand labor costs over $5. The machines save their cost in a very short time.

Before truck's positioned over manhole . . .

Metal ring is cemented into hole, and . . .

Special Truck Protects Splicers, Speeds Work

R. K. **WOODSON**, Underground Department, Kansas City Power & Light Co, Kansas City, Mo.

Safety, efficiency, and all-weather protection for workers are features of Kansas City Power & Light Co's new cable splicers' truck. All work can be done from within the truck which protects workers from traffic hazards and weather.

The special vehicle was originally a delivery truck. A hole about 32-in. square is cut in the truck floor, just inside the double doors at the rear.

When work is to be done in a manhole, a metal ring is cemented into the manhole opening so that water cannot enter the manhole. The truck is positioned so that the hole in the truck floor is directly over the manhole opening. A canvas boot is then fastened securely around the metal ring, extended up through the hole in the floor, and fastened to the floor. This provides complete protection during inclement weather for men in the manhole and for passing of men, tools and materials between truck and manhole. During good weather, the rear doors of the truck are left open.

The truck is equipped with a 2-kva, 110-v, 60-cps generator, a water pump, blower for ventilation, two-way radio, and an "intercom" set for communication between workers in the manhole and those in the truck. A 24-ft extension ladder is used for manhole access so that it will always project well above the truck floor.

One or the other of the front doors is left open for ventilation. It is not unusual for the helper in the truck to be working in his shirtsleeves during zero weather.

The new truck eliminates the old tool cart, manhole guard, and pick-up truck for transporting tools and materials. Moreover, it eliminates the tent formerly used for manhole opening protection during bad weather.

Canvas boot is extended from ring to . . .

Hole in the back of the truck floor

New Scheme Cuts Cost of Regulating Feeders

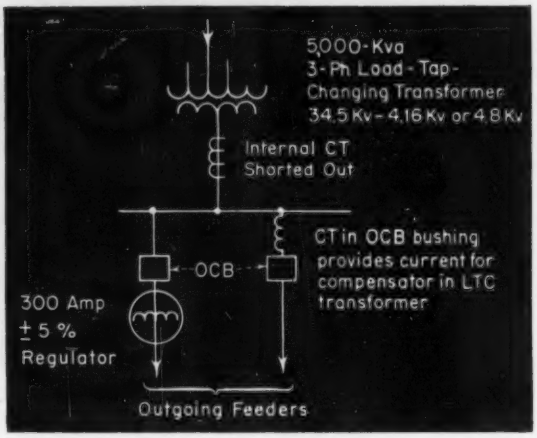
R. H. SIMS, Supt of Coast Division, Jersey Central Power & Light Co, Asbury Park, N. J.

An economical, effective scheme for regulating voltages of two different length feeders out of a load-tap-changing substation is being used by Jersey Central Power & Light Co. The scheme consists of setting the LTC for conditions on the short feeder and providing small boosters for the longer feeder. In this way, cost of regulators is reduced while effective regulation is maintained.

Control for the LTC equipment is taken from the bus in the usual way. But current for its line-drop compensator is provided by a current transformer in the short feeder rather than by the CT in the station transformer. This ± 10% regulation in the LTC controls voltage on the bus and on the one circuit which feeds directly from the bus. Additional voltage boost for the longer feeder is provided by a supplementary regulator of only 5% range connected between the bus and the feeder terminal.

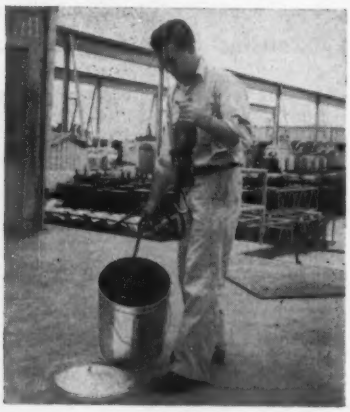
This arrangement is economical because the incremental cost of the tap changer in the 5,000-kva transformer is about the same as a set of 300 amp, ± 10% regulators. Thus the saving is the difference in cost between a second set of ± 10% regulators and a set with ± 5% range.

In addition, this scheme is attractive to Jersey Central P&L Co because it provides a way to use a large number of 150 amp ± 10% regulators in stock. These regulators are too small for normal circuit loading today. But they can be reconnected for 300 amp ± 5% and used to supplement bus regulation. This application eliminates purchasing new regulators by using older regulators which otherwise would have to be retired because of their small size.



TWO FEEDERS are regulated by setting LTC for conditions on short feeder and adding booster to the longer feeder

The possibility of using this arrangement economically in a substation with more than two feeders would depend on how many supplementary regulators would be required because of different characteristics in the individual feeders.



Garbage Can Stores Block and Tackle, Saves Time and Keeps Lines Cleaner

R. N. ROUSE, General Substation Foreman, Gulf States Utilities Co, Beaumont, Texas

Ten-gal garbage cans are being used by Gulf States Utilities Co for storing block and tackles. This practice saves substation crews considerable time because it is easier to coil ropes into cans than hand coil them, and ropes do not snarl when removed. Moreover, use of the cans keeps the lines cleaner.

The can is a standard 10-gal garbage pail, with lid. It will hold 275 ft of ½-in. line and a two and three-sheave set of blocks.

New transformers equipped with 1½-in. drain valves can be drained or filled with oil in about half the time formerly needed, reports Idaho Power Co. With a 1-in. drain valve on a 10,000-gal transformer, it took about 8 hr to drain or refill the unit.

A corkscrew-shaped reamer made from flat-iron stock speeds cleaning of transformer cooling headers in a New England hydroelectric plant. Attached to the corkscrew is a small pipe drive-shaft that is powered with an air drill motor.

Versatile Machine Digs Holes in Any Soil

ALL-PURPOSE DIGGER is mounted on a 175-in wheelbase, 190-hp, 10-wheel truck. Earth-boring unit has 16-ft long rack bar. Two augers are carried on deck

Adaptability to dig holes in any type of soil has been designed into a new machine by San Diego Gas & Electric Co. The new digger will operate in outlying areas where rocky soil prevents regular equipment from digging all holes in a particular line. Under these conditions, the new unit eliminates the need for hand-digging crews to travel long distances to dig a few holes. Operating experience with the first unit has justified the building of a second digger.

The new digger is built on a 175-in. wheelbase, 190-hp, 10-wheel truck which has a 5-speed transmission (fifth direct) and a 3-speed auxiliary transmission. The earth-boring unit has a 16-ft rack bar which enables the machine to dig holes 10-ft deep.

Three sizes of augers—16, 20, and 24 in.—are standard equipment. Two augers are carried on mounts on the deck, while the third is attached to the boring unit. Extra bits and miscellaneous equipment are carried in compartments on right side of truck.

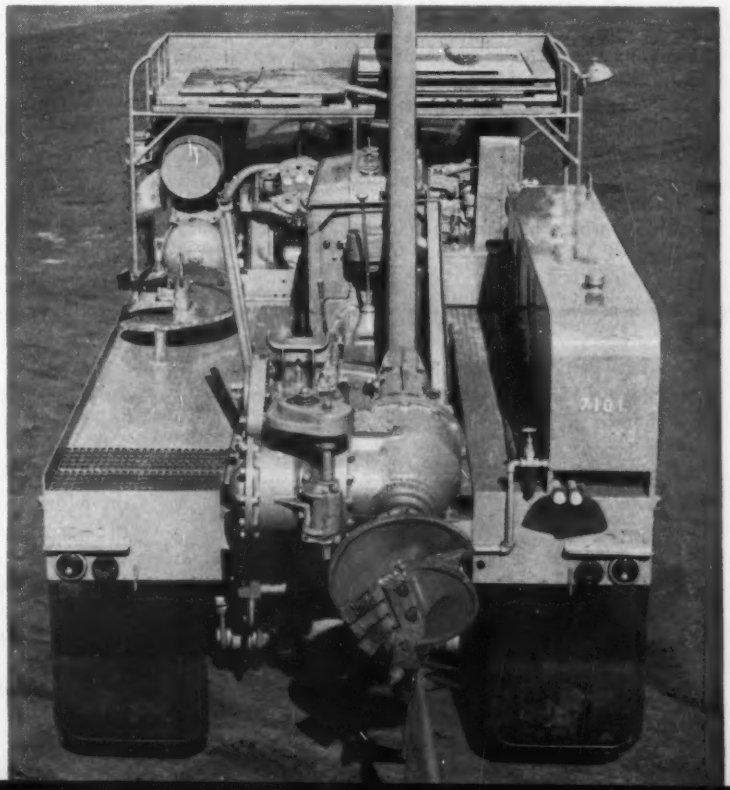
For digging in rocky soil, the truck mounts an 85-cu ft/min air compressor powered by its own engine and a medium-size jack hammer. The compressor supplies 75 ft of hose reeled on a live-hose reel carried in a compartment on the right side of the truck. For manual digging, the truck carries shovels, digging bars, etc, in a tunnel compartment.

Should blasting be required, the truck is equipped with a woven-rope blasting mat carried in its own compartment. Blasting caps and dynamite are kept in separated, locked magazines within the truck body.

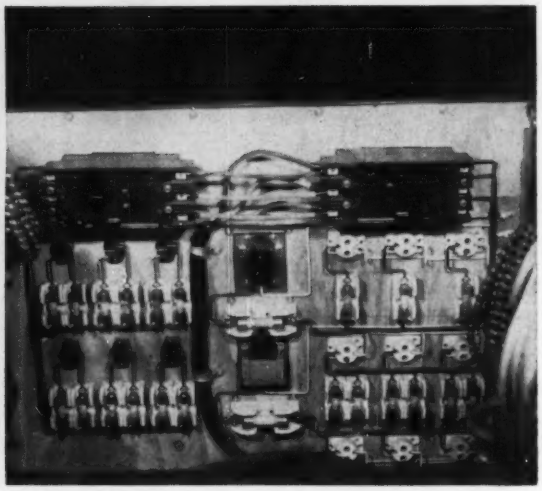
To speed digging in sandy soil, the truck mounts a 50-gal water tank. Water is piped to a point just over the rear of the truck. The crew takes a sand barrel along when they expect to dig in sandy soil.

A storage rack behind the cab and over the compressor will hold up to 30 wooden pole-hole covers. These are secured for travel by chains and spring snap locks. Steps built into the right-hand side of the truck allow the digger operator to mount the deck easily. A steel grillwork is built over the left rear wheels to allow crew members to remove mud or dirt from their shoes. This safety feature reduces the chances of slipping on the steel deck.

COMPARTMENT SPACE is provided in truck for 75 ft of air hose, shovels, digging bars, and extra auger bits. Light over the steps provides added safety at night



PORTABLE HEATER RACK accomodates 51 bolt heaters with proper cords and plugs for connection to fused receptacles



RECEPTACLE FUSES are connected to circuit breakers that are supplied through a 50-ft cord from a station circuit

Bolt-Heater Rack Speeds Turbine Jobs

FLOYD W. BAKER, Muskingum River Plant, Ohio Power Co, Beverly, Ohio

A portable bolt-heater rack, used by maintenance men of Ohio Power Co's Muskingum River Plant, saves time in preparing for turbine jobs. The rack holds all necessary equipment grouped conveniently and ready for use.

The rack accommodates 51 bolt heaters with proper cords and plugs identifying rated voltages and wattages ready for connection to the proper fused receptacles—six for 220 v, nine for 110 v low wattage, and two for 110 v high wattage. These fused receptacles are connected to the main 220 and 110-v circuit breakers, respectively, which in turn are joined to a single 50-ft power cable whose polarized plug can be connected to the nearest 110/220-v station circuit.

Except for the two 110-v high-wattage ones, each receptacle has a 30-amp fuse. The two exceptions are rated 40 amp. Hence only the heater whose fuse blows becomes inoperative instead of four or five as formerly. The rack has a framework of 1½ x 1½-in. angle irons. Holes in the top of the side frames hold the heaters in a vertical position while in storage. A fork-lift truck moves the rack.

Using this rack, only about a half hour is now required to prepare for a bolt-heating job. Compared with the old method, 5½ to 7½ manhours are saved.

Formerly four or five pigtails had to be connected to each extension cord so that the proper number of bolt heaters could be connected to each cord. Several extension cords were strewn around the turbine-room floor. Often the bolt heaters overloaded a circuit, blew a fuse, and left four or five heaters inoperative. Invariably this wasted time as the condition couldn't be detected until the bolt heaters cooled. Normally 6 to 8 manhours were used in preparing for a bolt-heating job.

Hot heaters can be stored in the portable bolt-heater rack safely after completion of a job. The rack may be used also for relieving weld stresses where a voltage of 110 or 220 is required. Labor and material for fabricating the rack cost under $200.

Canopies on White Way type street lamps are prevented from falling when broken by wiring between the set screws of the canopy and the globe. The small copper wire used cannot be seen from the ground.

Butting two cable crossing signs at a 45-deg angle facilitates reading of the warnings from vessels in the harbor. Essex County Electric Co previously placed only one sign parrallel to the shore.

Insulated-electro hydraulic ladders mounted on trucks will end climbing of poles, says a western utility. This prediction is based on experience with this equipment for connecting transformers and mounting street light fixtures. The latest version of a truck-mounted ladder will permit the raising of a man and transformer to a mounting position. For full utilization of truck-mounted ladders, future overhead distribution facilities must be designed with use of the equipment kept in mind.

Circular Slide Rule Saves Dispatcher's Time

K. S. BUCHANAN, Engineer, System Operation, Florida Power & Light Co, Miami, Fla.

A circular loading device for presenting precalculated economic-dispatch schedules has been developed by Florida Power & Light Co. By presenting data in the more compact, easier-to-use circular form, the device saves time for system dispatchers in following schedules and determining division of load between plants and tie lines.

Heart of the new device is a 10-in. paper disc that is divided into 40 segments to provide space for a 400-Mw load range, 10 Mw per segment. Each segment is divided into 18 major sections: One for total system load, one for each of eight principal plants, one for each of five stand-by plants, and one for scheduled interchange with three other systems. Four major sections are subdivided to provide space for subtotals of high-pressure and low-pressure generation as well as total generation.

On both sides of the paper disc are 10½-in. diam ⅛-in. thick plexiglass discs for protection. A movable plexiglass index, which identifies the values printed on the paper disc, permits rapid, accurate reading of the division of load for a given system load. "Breakpoints" in the plant loading curves are shown by shaded-in segments. Generation valves are used as base point settings for the automatic load-frequency-control equipment.

Paper discs with economic-dispatch schedules for the most important combinations of units are filed and placed in the circular holder as needed. Similar devices are used at generating plants to aid following of precalulated generation schedules.

Presentation of the schedules in circular form was developed by W. Monroe Pope, Southern Division Dispatcher. For this idea he was awarded the grand prize in the company's suggestion contest for the first half of 1955.

CIRCULAR DEVICE presents economic dispatch schedules in a more-compact form which is easier for dispatchers to use

Operations Center Saves $100,000 Yearly

LEO H. EAST, Vice President, Rochester Gas & Electric Corp, Rochester, N. Y.

A new operations center being built five miles south of town will save Rochester Gas & Electric Corp over $100,000 annually. Much of this saving will result from less travel by crews and trucks in congested downtown areas. And increased loading space and centralized storage will increase efficiency.

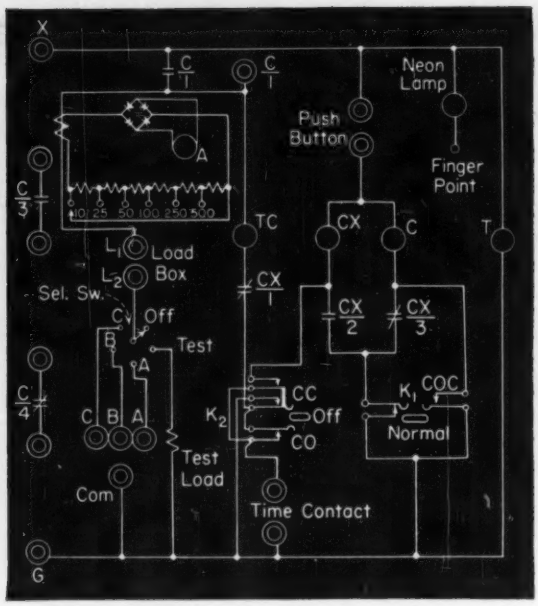
Site of the center, which will be completed in several years, is on the outer ring of a highway system planned for Rochester. A new highway will ring the city's circumference, and a "fast" road will form an inner ring nearer the heart of the city. Present streets will act as spokes to carry traffic to the hub of the city.

Three wings have been built and are occupied in this 60-acre rural setting. Line, gas, and street lighting trucks, warehouse facilities, transformer repair shops, the turn-on and shut-off department, house-heating service, tool rooms, and pole storage already have been relocated. RG&E estimates that these relocations should save over $100,000 a year in travel time and reduce loading time. An additional $20,000 a year for warehouse rental will be saved also. Relocations that will save the most money already have been made.

The consolidation of equipment already has helped the utility increase general efficiency. Many trucks no longer make two or more stops to pick up supplies and materials needed for the day's job nor wait in line for loading. The new center has the capacity for loading 25 trucks at once, and electric fork-lift trucks (recharged at night) facilitate material handling in the warehouse where some materials are stacked 12 to 15 ft high.

Some consolidation of operating departments will provide savings. For instance, the turn-on and shut-off departments of both the electric and gas companies are now handled by one crew.

RELAY TEST SET fits in fiber-covered case, 16¾ in. long, 9¾-in wide, and 10-in. high. The weight is 27 lb



OPERATION OF THE SET is controlled from a push button on a long cord, which permits the operator to view the relays

Set Field Tests Relays, Breakers Accurately

J. R. ELLISON, System Laboratories, Oklahoma Gas & Electric Co, Oklahoma City, Oklahoma

A special instrument for field testing overcurrent time-delay relays has been developed by Oklahoma Gas & Electric Co. Use of the set permits accurate determination of time-current characteristics of relays and also closing, opening, and open-close times of oil-circuit breakers. Moreover, the set is safe and easy to operate, simple to connect, and compact. These features led to standardized procedures reducing short circuits and incorrect connections.

In the instrument a selector switch allows connections to be made to three single-phase relays, and these connections are not changed during a complete time-current test. With this arrangement a given current can be applied successively to each relay. This eliminates the tendency to test completely a single relay with insufficient cooling time between applications of current.

The multi-range ammeter has a range greater than that normally required for relay testing, eliminating external metering. The ammeter and its current transformer, range-selector switch, and rectifier are components of a clamp-on ammeter.

Primary relay in the instrument is the contactor "C" (see drawing above). Its contact "C/1" has a capacity of 50 amp ac. Also, it has two auxiliary contacts "C/3" and "C/4" for actuating control circuits of a circuit breaker when determining its opening and closing time.

Auxiliary relay "CX" controls the timer. "TC" is the timer clutch and "T" is the timer synchronous motor.

Terminals "X" and "G" are connected to a 120-v, 60-cps source. "G" is customarily connected to the ground side. The "finger point" is a convenient means of checking polarity.

Telephone keys "K1" and "K2" are used to switch the test set to different modes of operation.

To control the operation of the instrument, a push-button of the meter-testing type is used. It is connected by a 6-ft cord to the pushbutton terminals.

The test set connects directly to the relays after they have been isolated from the current transformer and circuit breaker trip circuits. Using test blocks and jumpers, a common connection is made between one side of each relay current coil and the test set "Com" terminal. The other side of each relay current coil is connected to the "A," "B," and "C" terminals. Relay contacts are connected in parallel and then to the binding posts marked "Time Contact." One or two load boxes are connected to "L1" and "L2."

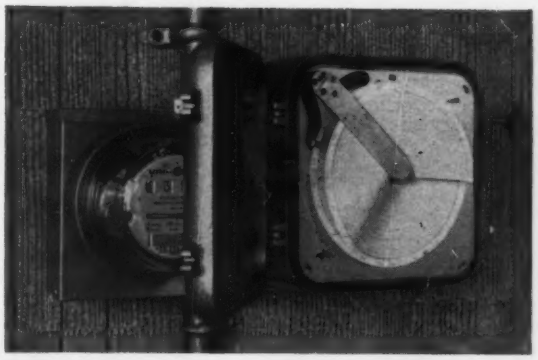
The "test" position of the selector switch connects a test load in series with the ammeter. This allows an approximate adjustment of current before passing it through a relay. The ammeter is equipped with a pointer stop. By reducing the "swing time" of the ammeter and the final adjustment time of the current, undue heating of the relay current coils is materially reduced.

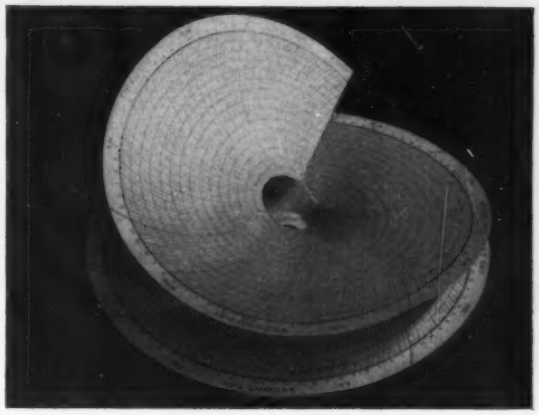
With the selector switch in position "A," "B," or "C," current is passed through a relay by closing the push-button. This picks up contactor "C" and starts the timer "T." When the relay contact closes, the timer stops and contactor "C" opens. This is the sequence when the test is set up to measure contact closing time.

For measuring opening, closing, or round-trip time of a circuit breaker, the "Time Contact" is connected across one pole of the breaker. Telephone keys are set appropriately, and contacts "C/3" and "C/4" are connected as required. Closing the push-button gives the time measurement.

Spiral Chart Halves Meter Service Calls

J. W. DYE, Supt, Meter and Test Section, Long Island Lighting Co, Hicksville, N. Y.





Spiral circular charts and novel adapters for recording wattmeters have been developed by Long Island Lighting Co for load survey work. Use of the chart and modified instrument provides advantages of both circular and spiral chart meters and practically halves labor costs for service calls on these instruments.

The special spiral chart is made by cutting a circular chart radially using a knife and die. One end of the cut chart is then taped to a second radially cut circular chart. The resulting spiral chart can be easily interpreted and filed.

When the spiral chart is positioned in a thermal recording meter, the upper chart is held clear of the pen by an adapter. This consists of two aluminum bars, secured to one corner of the meter, between which the chart rotates. Conversion cost of a meter is recovered after a month's operation.

About 50 thermal recording wattmeters have been converted for use with the spiral charts. Because of close clearances and other operational difficulties, it has not been possible to "sandwich" more than two charts together.

Shop assembling of pole-line equipment on arms and special brackets, now in experimental stage, is expected to reduce costs for a Southwestern utility.

Bringing the budget up to date monthly eliminates the year-end rush and saves time for Potomac Electric Power Co.

Non-professional people are processing most of the small distribution jobs for Potomac Electric Power Co. About half of the men in the Distribution Engineering Div office force, excluding clerks are non-professionals who work under limited supervision.

Pallets are being purchased by Potomac Electric Power Co for use by both manufacturers and the utility to simplify handling of materials.

A "man lift" reduces construction time of boilers by eliminating the need for workmen to climb ladders and stairs when traveling between floors. The machine used by Georgia Power Co consists of a vertical conveyor belt having "steps" on which men can stand and handles to which they can hold. Movement of the belt is continuous and slow.

Expansion of the truck stock method of accounting to an entire store room handling distribution materials is expected to save considerable paper work expense for a western utility. Under this new plan, all material except "fundamental units of property" will be charged out free from the store room for accounting purposes. Fundamental property units include poles, transformers, cross-arms, and conductor. The charge-free items will be accounted for by proportioning their cost to the cost of units of property.

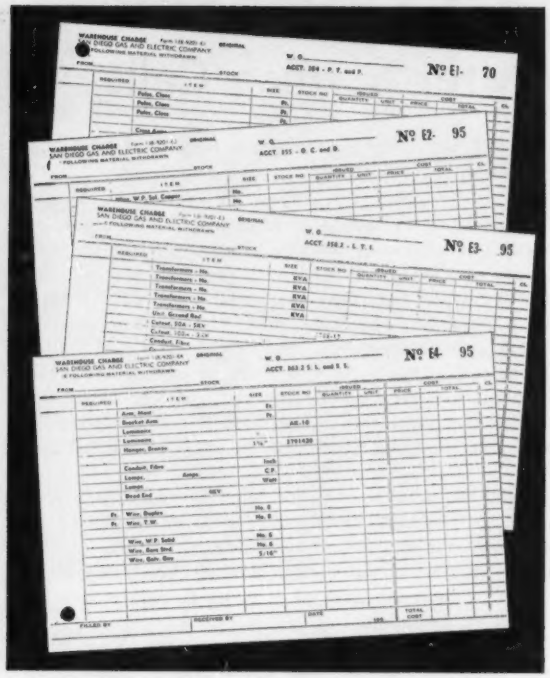
First step of 277/480-v underground network will soon be installed in part of Miami by Florida Power & Light Co. Economics of such a network favor both utility and customer.

Records management system is being established by a Southwestern utility to improve the handling of all kinds of records, correspondence, and periodicals from the time they are created or received until they are destroyed or filed in permanent file. Because centralized filing will be more dependable, individuals will not have to maintain duplicate files, and the total filing effort will be reduced.

SAN DIEGO GAS & ELECTRIC COMPANY

NIGHT ORDER

NIGHT ORDER FORM lists 177 items most-frequently used by the linemen when working on overhead distribution lines



WAREHOUSE CHARGE
SAN DIEGO GAS AND ELECTRIC COMPANY

WAREHOUSE CHARGE FORMS cover non-exempt items which require pricing and extension for charging costs to the jobs

Exempt Materials List Cuts Paper Work

Paperwork representing the time of three fulltime clerks was eliminated when San Diego Gas & Electric Co set up an exempt materials list for overhead distribution lines. Two clerks in the stores accounting section and one in the stockroom office have been freed for other work.

Here is how the plan works. The exempt materials list includes the miscellaneous items most-frequently ordered by line crews for the construction, operation, and maintenance of overhead distribution lines. Covered in the list are 177 items, including bolts, clamps, connectors, some insulators, nails, racks, screws, sleeves, splices, straps, tape, thimbles, washers, and tie wires. These items are withdrawn from warehouse stock by line crews without charge by indicating the amounts of each item needed on a "night order" form. No additional copies of this form need be filled out when material is withdrawn.

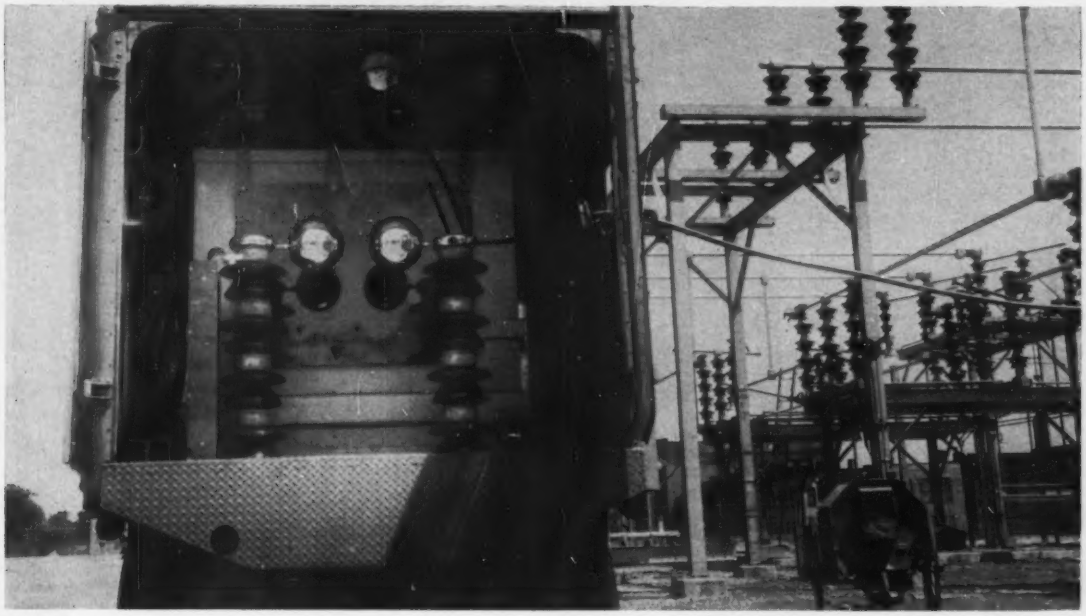
The night order form is used only when material is withdrawn for use in constructing, operating, or maintaining the overhead distribution system. For other uses, the items are listed on "warehouse charge" forms which require pricing and extension of items for charging costs directly to jobs by accounts. For other than exempt materials required by distribution line crews, the warehouse charge form is filled out, including the work order number.

Warehouse charge forms are sent to the stores accounting section where pricing and extension of non-exempt items are done to charge costs directly to jobs by accounts. The general accounting department adds certain percentages to non-exempt materials costs so that the cost of exempt items will appear in total job costs.

These percentages were determined by analysing 200 overhead construction jobs during which the cost of exempt materials was segregated from other costs. Total exempt items costs were compared with total costs of all other materials to calculate the percentages. The same procedure was used to establish the percentage for distributing exempt item costs to operating and maintenance accounts, except that the analysis covered one year's charges of exempt and non-exempt materials and supplies charges.

For proper inventory control exempt materials issued from stock without charge are charged to General Ledger Account—Exempt Material and credited to General Ledger Account—Material and Supplies, when placed in bins. Cost of exempt items distributed to operating, maintenance and construction accounts is credited to the Exempt Material account. The undistributed balance remaining in this account represents the value of exempt material in bins and carried on trucks. Reconciliation to control requires physical inventory of truck stock and storeroom exempt stock.

Control of physical inventory of exempt items to maintain an adequate supply in the warehouse is not difficult. The stock of exempt materials is placed in identified bins and stock card quantity balances are reduced by changes to Exempt Material account. Stock card balances after reduction for quantities placed in exempt material bins represents the principal stock of material carried in warehouses at other locations.



REAR INTERIOR VIEW of truck shows equipment tank, sphere gap with supports, and test lead connected to output post. Grounding switch is in raised or open position. In actual use, rear doors must be interlocked to energize the set

SUBSTATIONS—Testing

Mobile Unit Tests Anywhere at 250 Kv Dc

A new 250-kv mobile test unit, placed in operation recently by the substation operation department of Consolidated Edison Co of New York, offers the advantages of compactness and maneuverability over conventional portable test equipment.

This unit was developed by Beta Electric Corp in collaboration with Con Edison's inside plant engineering section. Its use minimizes the need for permanently installed test sets in future stations.

The truck-mounted unit contains a 250-kv test set for portable proof testing of new 69 and 138-kv station equipment, buses, breakers, transformers, and feeder circuits before these are placed in service.

The test set is a 0-250,000-v, dc, cable test set, energized from a 60-cps, 208-v single-phase supply source and designed to deliver 20 ma at 250,000 v, or 100 ma at 125,000 v. A four-stage, half-wave, voltage multisphere circuit is used in the set. The set's three main components are:

1. The control cabinet chassis and panel mounting all switches, meters, pilot lights, controls, etc.

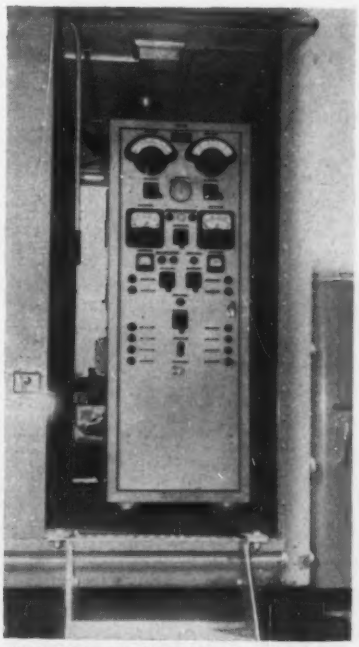
2. The oil-filled tank containing all high-voltage transformers, rectifiers, capacitors, resistors, etc.

3. The output bushing and sphere gap.

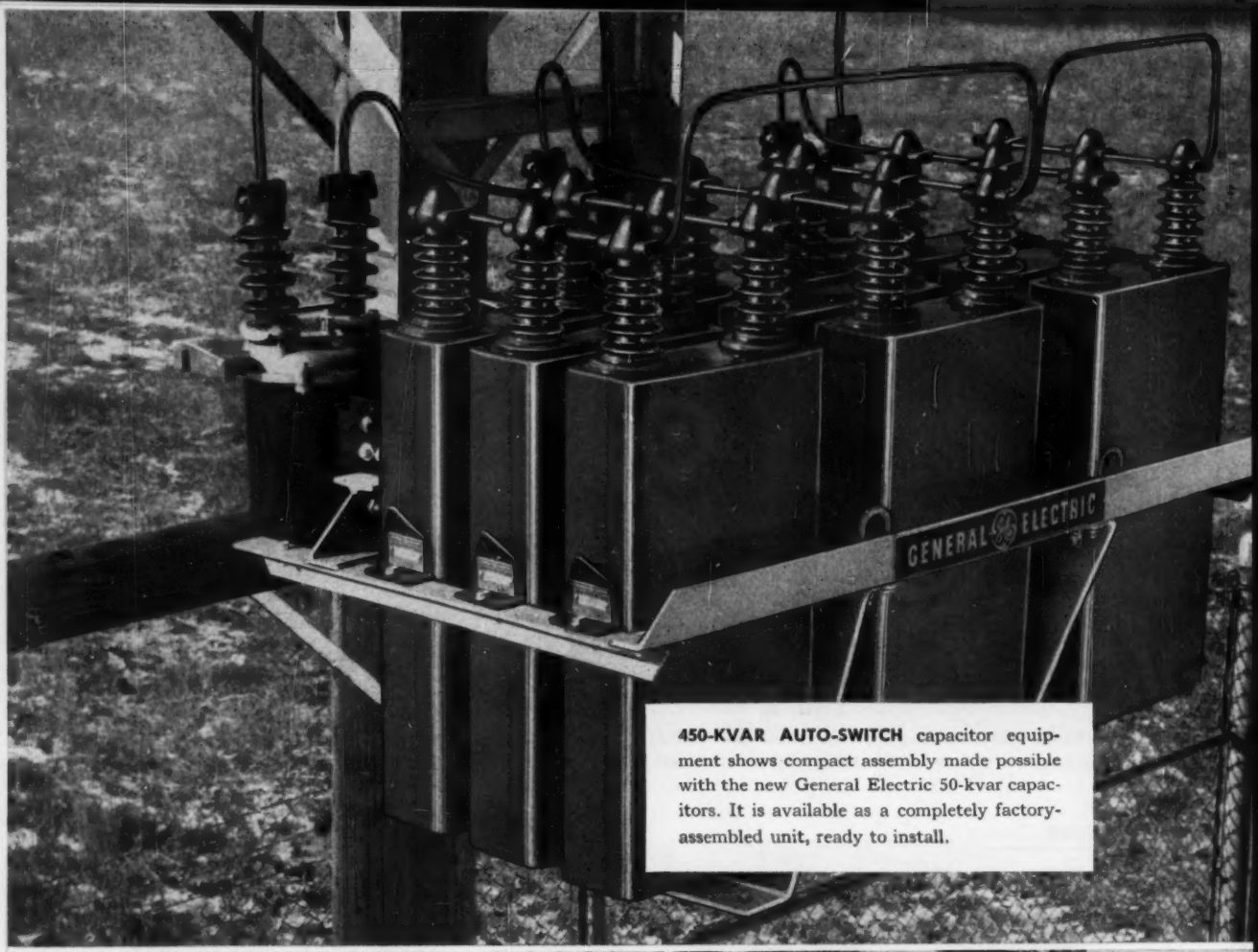
The truck's high-voltage compartment is interlocked so that the set can't be energized unless the rear doors and front access door are closed. Besides an electrical grounding switch built into the tank, a hand-operated mechanical ground switch operated from the control compartment of the truck assures the utmost safety to operating personnel making connections.

Test leads are R6 8/U coaxial, a shielded polyethylene insulated cable rated at more than 300-kv. It is fitted with anti-corona shields, and the shield covering is grounded while the set is in use. Ground for test equipment and truck is supplied from system ground wherever available.

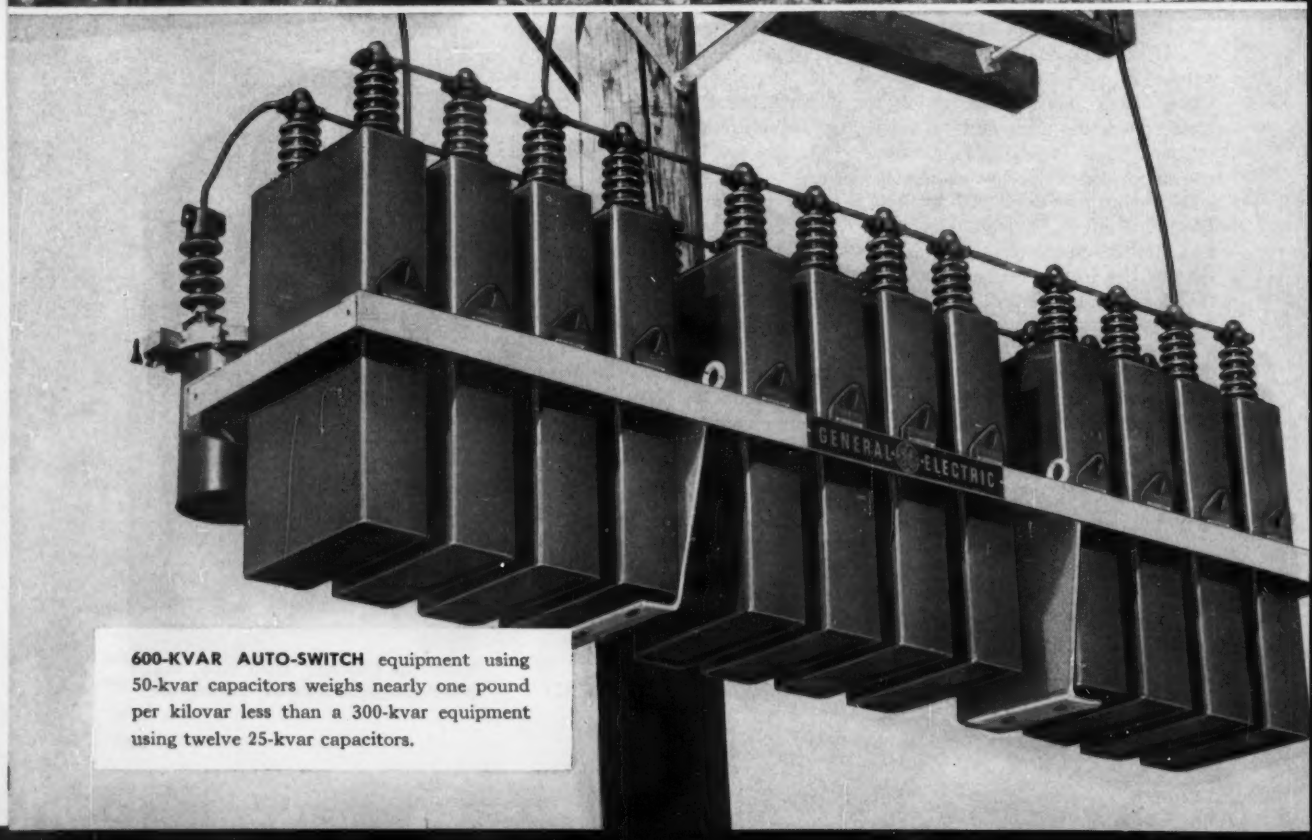
(*More How To on page* 92)



CONTROL CABINET, front view, shows panel-mounted switches, meters, etc



450-KVAR AUTO-SWITCH capacitor equipment shows compact assembly made possible with the new General Electric 50-kvar capacitors. It is available as a completely factory-assembled unit, ready to install.



600-KVAR AUTO-SWITCH equipment using 50-kvar capacitors weighs nearly one pound per kilovar less than a 300-kvar equipment using twelve 25-kvar capacitors.

New G-E 50-kvar Capacitors Double Auto-switch Capacity

Higher rated units mean lower costs, less weight and bending moment, lower switching cost, per installed kilovar

General Electric's new 50-kvar capacitors, designed so that they have the same mounting dimensions as existing 25-kvar units, now enable you to put MORE kilovars on the pole with sizeable savings in space, weight, and cost per kvar.

More compact equipments made possible with these new capacitors can give you double the kilovars formerly available in 25-kvar capacitor equipments with little or no increase in rack dimensions. Racks are factory assembled, and are available in ratings from 2400 to 13,800 volts.

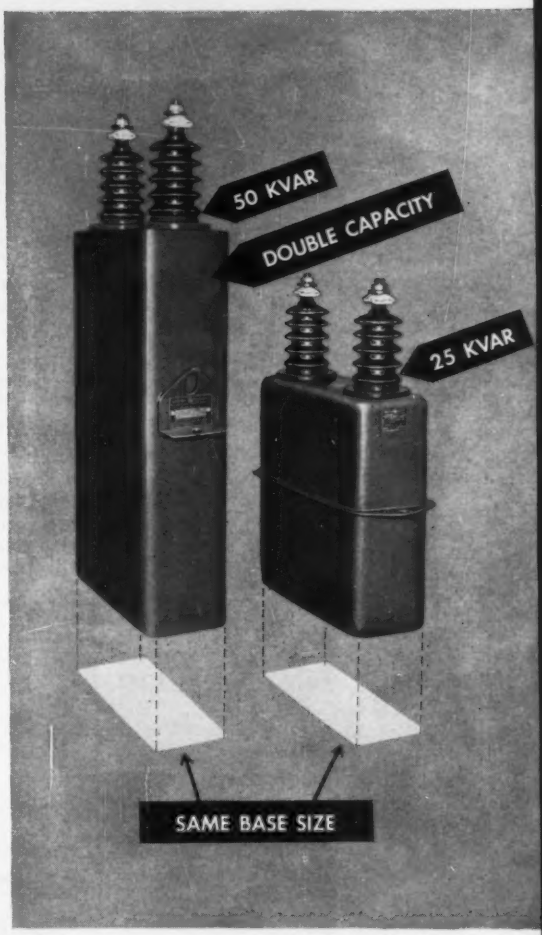
Reduced weight per kvar is made possible because one 50-kvar capacitor weighs approximately 15% less than two 25-kvar units. This results in even further weight savings in complete auto-switch equipments. For example, a single row auto-switch made up of twelve 25-kvar units weighs about 1110 lbs or 3.7 lbs per installed kvar. Use of 50-kvar units in the same arrangement gives you a pole-mounted equipment of only 2.8 lbs per installed kvar.

This 25% savings in weight per installed kvar is doubly significant. It means that bending moment on poles, an important consideration today, may be notably reduced per installed kvar by the use of 50-kvar capacitors in pole-mounted equipments.

Low kilovar costs also result from the use of 50-kvar capacitors. One 50-kvar unit costs 10% less than two 25-kvar capacitors. And, in switched equipments, switching cost can be reduced as much as 13% since a 600-kvar auto-switch requires no more switches than a 300-kvar equipment.

New features, too, have been built into the 50-kvar capacitor auto-switch designs. New neoprene switch terminal boots require no taping. Self grounding washer-head mounting screws eliminate loose parts, and provide permanent unit case grounding.

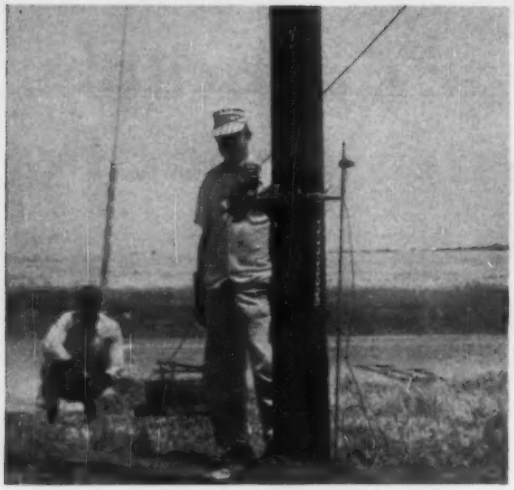
Orders are now being accepted for the new, higher rated auto-switches. The new bulletin, GEA-6485, contains full information on the 50-kvar capacitor equipments. Just contact your G-E Apparatus Sales Representative, or write to the General Electric Company, Section 441-34, Schenectady 5, New York.



NEW G-E 50-KVAR CAPACITOR has been designed so that it will be interchangeable with existing 25-kvar units having standard NEMA mounting dimensions. Doubled capacity is achieved with an increase of only eleven inches in height over the 25-kvar G-E unit. It is available in both 5- and 8.7-kv classes.

Progress Is Our Most Important Product

GENERAL ELECTRIC



BRAKE facilitates wire stringing by allowing it to be handled from mounted pay-out reel or the reels themselves

WINCH on line truck is used as one of many convenient ways of pulling in wire, with brake maintaining pressure

Wire Stringing Brake Reduces Hazards

H. J. HROVAT, Crew Foreman, Kansas Gas & Electric Co, Newton, Kan

A special brake has been developed for Kansas Gas & Electric Co wire stringing operations where there are energized wires on the same pole or the wire being strung crosses energized circuits. The new brake saves time and reduces the hazards of the operation.

The brake is easily fastened to a pole with a chain. Wire is passed from the reel through the brake, where it is threaded through the sheaves and run up over the crossarm for stringing.

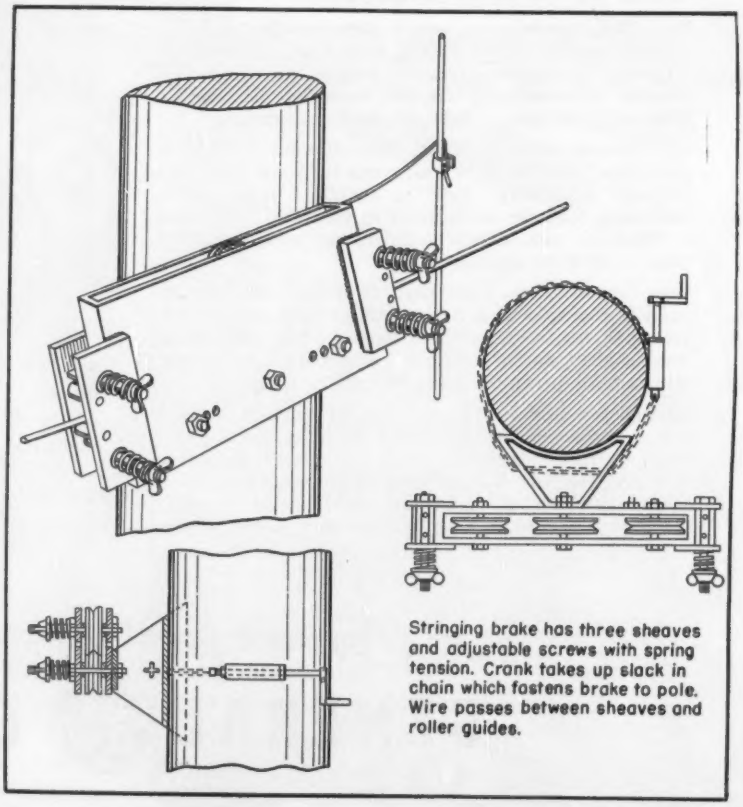
The brake, suitable for conductor sizes No. 6 to 2/0, has adjusting holes and spring tensions for different sizes of wire.

To keep the wire from being damaged, it travels on rollers throughout the brake. Two vertical and two horizontal rollers at each end of the brake are on ball bearings and act as guides.

The brake is fully automatic. It stops and holds the wire when pulling is stopped and starts again when pulling is resumed. Sleeves on small wire sizes pass through the brake.

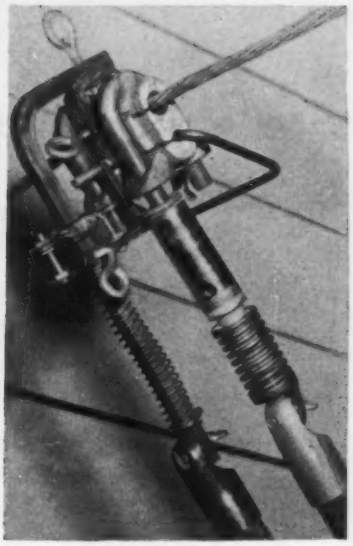
After the stringing operation has been set up, the wire is pulled in with a winch on the truck or by any conventional method. The brake maintains tension and brings the wire in smoothly and evenly. As there is no looping in the wire, there are no contacts with energized conductors. Wire can be strung from coils mounted on payout reels or from the reels themselves, depending on which method is the more convenient.

The brake measures 6 by 18 in. and weighs about 25 lb. It takes up little space in the truck and is light enough for one man to carry to where it is needed.

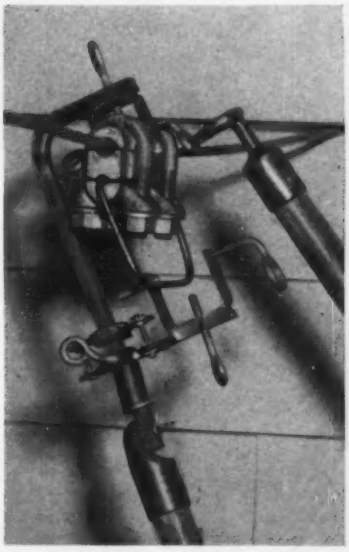


Stringing brake has three sheaves and adjustable screws with spring tension. Crank takes up slack in chain which fastens brake to pole. Wire passes between sheaves and roller guides.

U-BOLT PART of clamp is attached to the top part of the tool by tightening the three small eye bolts. Other eye bolts hold the spacer and the lower portion



WASHERS and nuts are installed with an end-on wrench stick, as shown



TOOL is removed after use by loosening the set screw with a tie stick

Tool Eases Hot-Line Connection to Aluminum Conductors

C. E. COOK, Safety Engineer, Southwestern Gas & Electric Co, Shreveport, La.

Making hot line connections to aluminum conductors was simplified by Jesse Anderson of Southwestern Gas & Electric Co by designing and making special tools for the purpose in his own workshop. A feature of the tools is the ease with which they can be released after a connector has been installed.

With these tools, the device to be installed is held between the ends of the eye bolts inserted in tapped holes in the sides of a U-shaped holding device. By tightening these bolts toward each other, the connector is gripped in a vice-like fashion.

A particular problem was presented by a three-piece, U-bolt type clamp because of the difficulty in holding and positioning the three parts during assembly with hot sticks. Use of the new tool for installing the U-bolt type clamp is illustrated in the accompanying photos.

The holder at the top is fixed to the end of a square rod bent in an L shape while the bottom holder is mounted on a carriage that slides on the square rod. The U-bolt part of the clamp is attached to the top part of the tool, by tightening the three small eye bolts. The remaining two pieces of the clamp, the spacer and the lower piece, are held together by another set of three eye bolts mounted on the sliding carriage.

Carriage Spring Loaded

The carriage is spring loaded to move upwards when released. As the bar upon which the carriage slides is square in cross-section, the two lower parts of the clamp are kept in alignment with the U-bolts during movement of the carriage.

In each of the three groups of eye bolts that hold the two sections of the clamp, the eye of one of the horizontal eye bolts has been bent at a right angle with the shank of the bolt. This permits these bolts to be turned with a cranking motion by use of tie stick inserted in the eye.

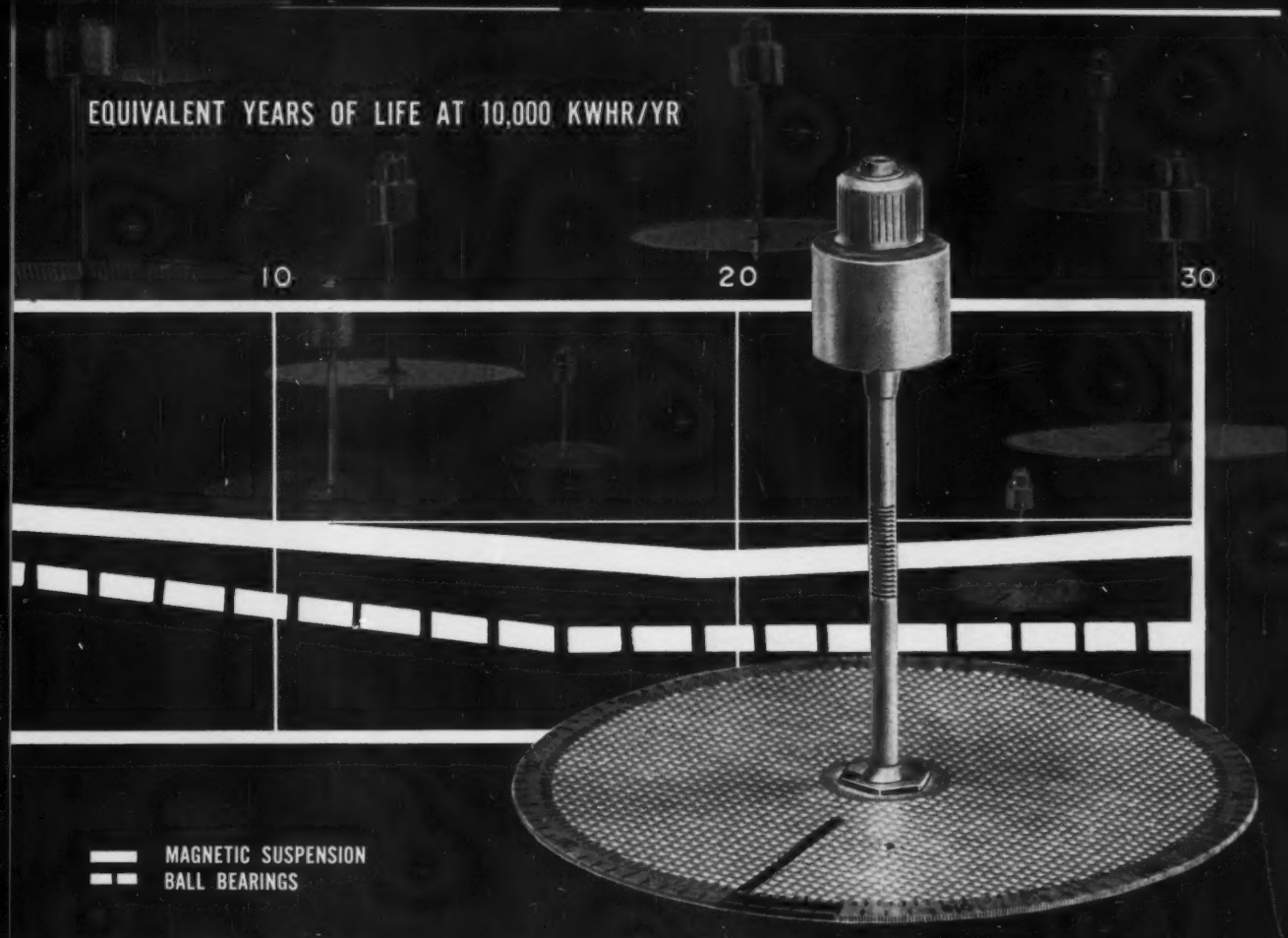
To position clamp on the conductor, the carriage is pulled down and held by another bent eye bolt that acts as a set screw in one bearing surface of the carriage. Loosening this set screw by a short upward movement of a tie

(*Continued on page* 111)

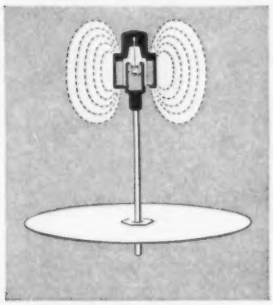
Life tests prove . . .

GREATER SUSTAINED ACCURACY

ALL THE COST-SAVING features of General Electric's I-50 meter family have been proved by the more than 6,000,000 I-50's in service today.



G-E MAGNETIC SUSPENSION ASSURES ACCURATE MEASUREMENT OF TOMORROW'S LOADS



MAGNETIC SUSPENSION of rotor eliminates conventional bearings, greatly reduces maintenance and replacement costs.

New test data on meter performance, compiled in G-E research laboratories, prove that General Electric's revolutionary "floating disk" will accurately measure tomorrow's greater loads. During these accelerated life tests, identical loads were applied to G-E meters with magnetic suspension and to meters using other types of bearing systems to support the moving element.

The test results, based upon a total load of 300,000 kwhr (the equivalent of 30 years' operation at 10,000 kwhr), proved that only General Electric meters with magnetic suspension offer you these important benefits:

Greater sustained accuracy (see chart above)

No bearing wear

Greater return on your meter investment

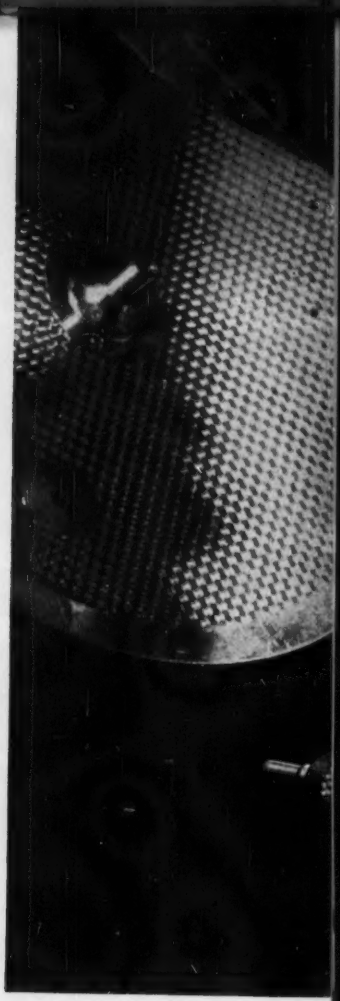
In addition to magnetic suspension, G-E meters provide you many other money-saving features. For example: all meters of the G-E I-50 family offer you a unique one-piece retarding system which assures stability and long life and rigid unit construction for maximum strength.

SEE HOW LIFE TESTS PROVE NO BEARING REPLACEMENT

GENERAL ELECTRIC

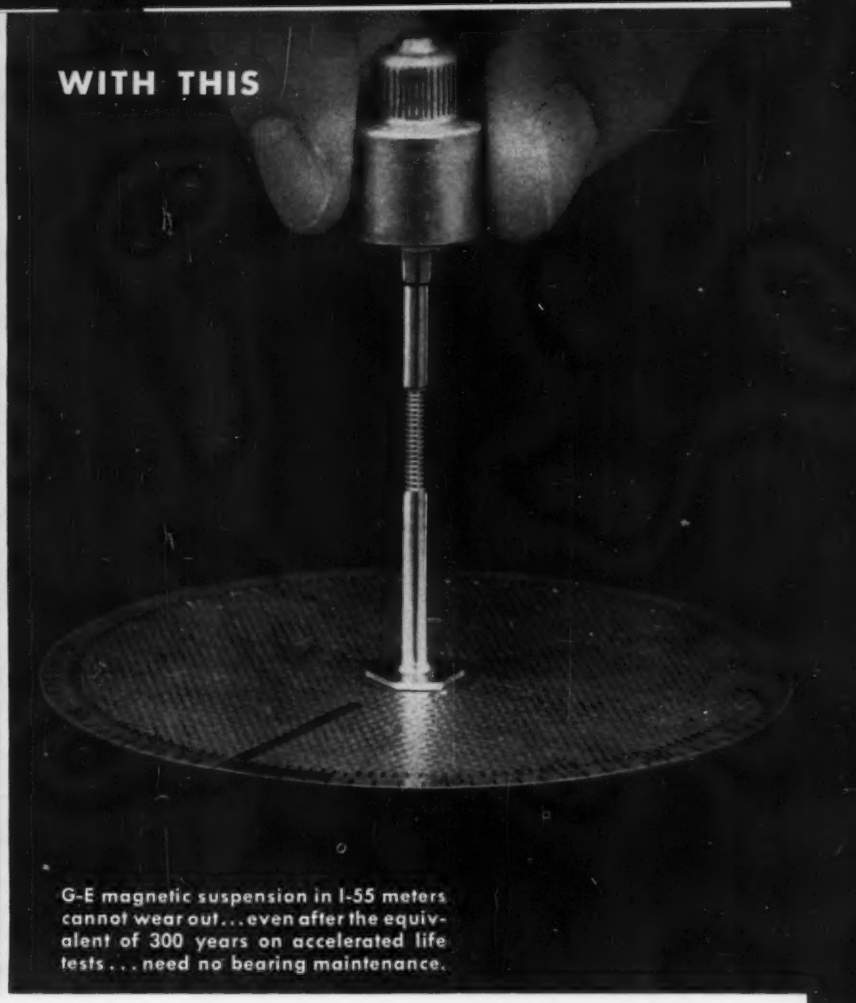
Life tests prove . . .

No Bearing Replacement



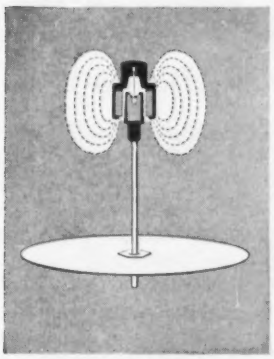
ALL THE COST-SAVING features of General Electric's I-50 meter family have been proved by the more than 6,000,000 I-50's in service today.

With ever-increasing residential electric loads, bearings in ordinary meters become worn in a few years... need to be replaced.



G-E magnetic suspension in I-55 meters cannot wear out... even after the equivalent of 300 years on accelerated life tests... need no bearing maintenance.

G-E MAGNETIC SUSPENSION LOWERS METERING COSTS BY ELIMINATING BEARING REPLACEMENT



MAGNETIC SUSPENSION of rotor eliminates conventional bearings, greatly reduces maintenance and replacement costs.

The trouble and expense of periodic bearing replacement is eliminated when you use General Electric meters with the revolutionary "floating disk." This fact was firmly established in a series of continuing accelerated life tests conducted at General Electric research laboratories. During these tests, identical loads were applied to ordinary meters using conventional ball bearings to support the weight of the moving element and to G-E meters with magnetic suspension. Here is what the tests revealed:

1. The ball bearings in ordinary meters must be inspected, and in many cases replaced, after a comparatively short period of time. Bearing wobble, excessive noise, and inaccurate performance necessitated removing the meters from the line and replacing their bearings.

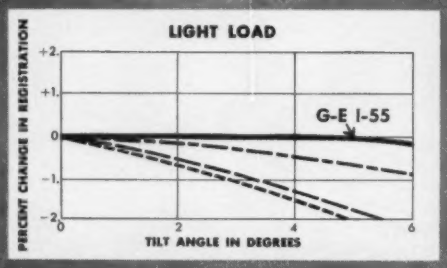
2. The magnetic suspension system in the G-E meters—even after the equivalent of more than 300 years' operation—showed no measurable wear whatsoever.

These tests substantiate the record of more than 6 million G-E I-50 meters in service today. They offer proof that G-E meters with magnetic suspension lower your metering costs by eliminating bearing replacement, and by more accurately measuring all the power you supply.

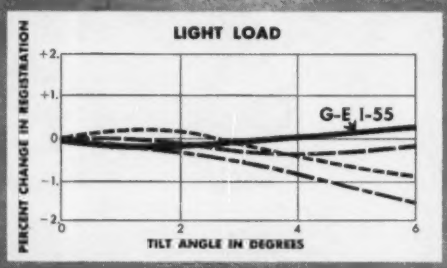
SEE HOW LAB TESTS PROVE FEWER TILT ERROR LOSSES

GENERAL ELECTRIC

CLOCKWISE

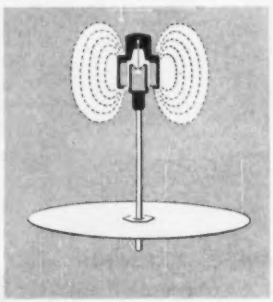


COUNTER-CLOCKWISE



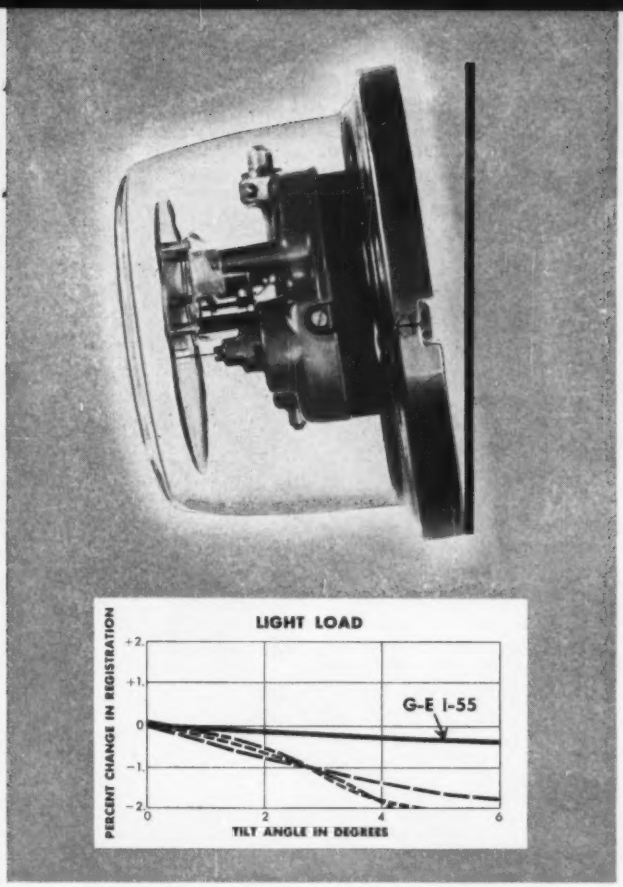
LEGEND: G-E I-55 meter ——— Meter "A" — — — — Meter "B" - - - - - - Meter "C" — - — - —

Lab tests prove . . .

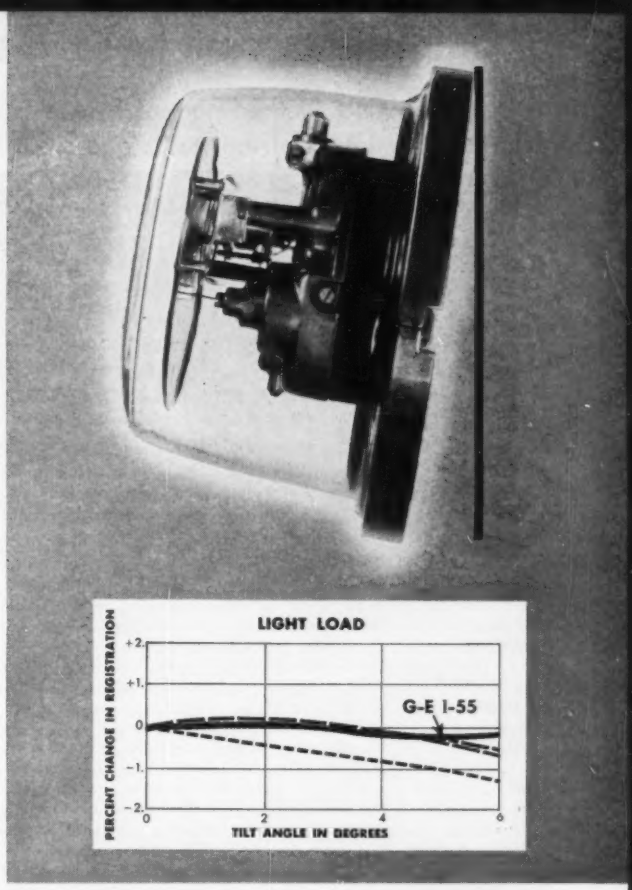


MAGNETIC SUSPENSION of rotor eliminates conventional bearings, greatly reduces maintenance and replacement costs.

FORWARD



BACKWARD



LEAST AFFECTED BY TILT

G-E MAGNETIC SUSPENSION SYSTEM SAVES YOU REVENUE NORMALLY LOST THROUGH TILT ERRORS

Any meter installed slightly out of plumb will give inaccurate readings which, in most cases, result in loss of revenue. By using General Electric meters with magnetic suspension the errors from tilt are virtually eliminated and the loss of revenue is negligible.

Recently a series of tilt tests were conducted at G-E laboratories. Both G-E meters with the "floating disk" and ordinary meters using conventional ball bearings to support the moving element were subjected to operation at various degrees of tilt. Here is what the tests revealed:

1. As the angle of tilt was increased on ordinary meters with ball bearings, additional friction resulted. This increased friction could result in substantial losses of revenue.

2. The magnetic suspension system of G-E meters developed no measurable friction when operated out of plumb . . . even as the angle of tilt was increased. Life of the G-E meters was not affected and only negligible tilt errors in registration resulted.

For other important money-saving benefits—greater sustained accuracy, longer meter life with less maintenance and testing time, and elimination of bearing replacement—specify G-E meters of the I-50 family . . . the only meters with the "floating disk."

FOR ADDITIONAL INFORMATION CONTACT YOUR NEARBY G-E APPARATUS SALES OFFICE, OR WRITE GENERAL ELECTRIC COMPANY, SECTION 621-9, SCHENECTADY 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Calculation of Loss Reduction by Capacitors

A simplified method to calculate loss reduction produced by shunt capacitors clarifies the nature of the losses and what load data are appropriate.

VICTOR J. FARMER, Electrical Engineer, Union Electric Co, St. Louis, Mo.

In an elementary circuit with active and reactive components of current represented by I_A and I_X, the watts loss is:

$$\text{Loss}_1 = (I^2_A + I^2_X)\,R \qquad (1)$$

If a shunt capacitor is connected to the circuit

$$\text{Loss}_2 = [I^2_A + (I_X - I_C)^2]\,R \qquad (2)$$

To determine the loss reduction, W_{LR}, produced by the capacitor, subtract Eq 2 from Eq 1 and obtain,

$$W_{LR} = 2I_C R I_X - I^2_C R \qquad (3)$$

Note that the term $I^2_C R$ is the loss in the circuit with no current flowing except the capacitor current—call this value W_C. Also the value $2I_C R$, when determined for a circuit and capacitor arrangement, remains constant. Then Eq 3 is written.

$$W_{LR} = KI_X - W_C \qquad (4)$$

Inspection of Eq 4 reveals these facts not always recognized:

1. Loss reduction produced by shunt capacitors is a function of reactive current only. The value of active current is immaterial and need not enter into loss reduction calculations.

2. The equation is linear with respect to I_X. Therefore, to determine kwhr loss reduction, only the average value of reactive current must be known. Logical way to determine this is by var-hour metering. Load factors, load cycles, and power factors are only substitutes for estimating average reactive current.

3. Eq 4 does not agree with the loss factor method of computation which assumes that loss reduction varies in proportion to the square of the load. The loss factor method is especially inaccurate in situations where loss reduction becomes negative during periods of low reactive current.

When analyzing complex circuits with several branches and capacitors, Eq 3 may be applied to the sections separately, then

$$\Sigma W_{LR} = \Sigma\, 2I_C R I_X - \Sigma I^2_C R \qquad (5)$$

and

$$K = \frac{\Sigma W_{LR} + \Sigma I^2_C R}{I_X(\text{total})} \qquad (6)$$

Eq 5 and Eq 6 assume that reactive load at each point in the circuit will vary in the same manner as the total reactive load. Ordinarily this is an acceptable assumption.

Capacitor losses, about 3.33 watts per kvar, should be deducted to obtain final results.

Example. Use of foregoing formulas is illustrated in calculation of loss reduction in a typical secondary capacitor application shown by the single-line diagram. Assume secondary capacitors will be installed as an alternate to primary capacitors. Under this condition, the internal losses, which would be about the same in either type of capacitor, should be omitted.

A. Solving for loss reduction:

$$\Sigma W_{LR}\,(\text{peak}) = \Sigma 2I_C R I_X = \Sigma I^2_C R$$

(For Transformer)
$= 2(25)\,(0.04)\,(75) - (25)^2\,(0.04)$

(For *Primary Main)
$$+ \frac{2(0.4 \times 25)\,(0.5)\,(0.4 \times 75)}{4} - \frac{(0.4 \times 25)^2\,(0.5)}{4}$$

(For Span A)
$+ 2(12.5)\,(0.0216)\,(2)\,(75/2) - (12.5)^2\,(0.0216)\,(2)$

(For Span B)
$+ 2(12.5)\,(0.0216)\,(2)\,(75/3) - (12.5)^2\,(0.0216)\,(2)$

(For Span C)
$+ 2(12.5)\,(0.0341)\,(2)\,(75/3) - (12.5)^2\,(0.0341)\,(2)$

$W_{LR}\,(\text{peak}) = 4.47\,(75) - 61.7$ (total)
$= 273.5$ watts loss reduction at peak load

$K = 4.47$; $W_C = 61.7$ watts

Average $$I_X = \frac{75{,}600}{0.24 \times 8{,}760} = 36 \text{ amp}$$

$W_{LR}\,(\text{average}) = 4.47\,(36) - 61.7$
$= 99.2$ watts (Average loss reduction)

$$\text{Net Annual Loss Reduction} = \frac{99.2 \times 8{,}760}{1{,}000} = 869 \text{ kwhr}$$

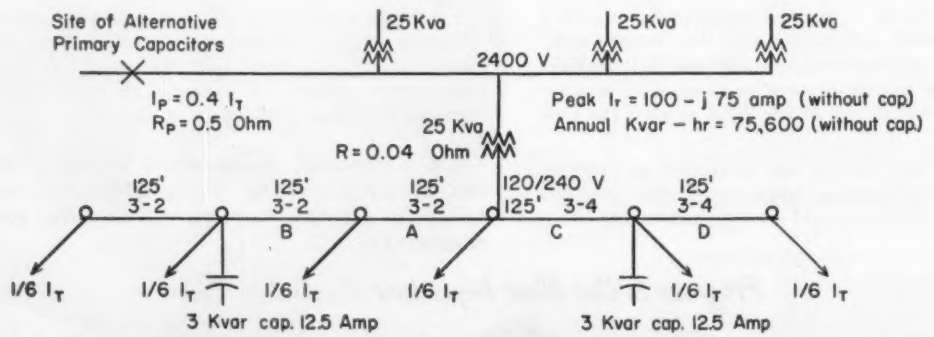
B. To examine the effect of substituting 5-kvar for 3-kvar capacitor units:

$W_{LR}\,(\text{peak}) = (4.47)\,(75)\,(5/3) - (61.7)\,(5/3)^2$
$= 387.3$ watts (Loss reduction at peak load)

$W_{LR}\,(\text{average}) = (4.47)\,(36)\,(5/3) - (61.7)\,(5/3)^2$
$= 96.8$ watts (Average loss reduction)

$$\text{Net Annual Loss Reduction} = \frac{96.8 \times 8{,}760}{1{,}000} = 848 \text{ kwhr}$$

The value of the 113.8 watts greater peak demand reduction would not usually pay for the larger capacitors and the 21-kwhr increase in annual losses. However, reduction in peak transformer kva loading, not evaluated herein, might justify 5-kvar units.



Secondary Capacitor Application. Four transformers on the primary (*See Example) have equal loads and capacitors

One of many advantages of 90/10 Cupro-Nickel

WELDABILITY

Welding head on filter shell

One of the relatively new copper base alloys is 90/10 Cupro-Nickel, which is coming into increased use as a result of experience with it. Revere offers it in sheet and plate, pipe and tube. It is highly resistant to corrosion and erosion, particularly in salt or brackish water. In addition it can be cold or hot worked, welded, soldered and polished. Because its nickel content is less than the older 70/30 alloy, it is priced lower.

The item shown here is a 90/10 Cupro-Nickel filter for aviation gasoline, designed and fabricated by the Warner Lewis Company, Division of Fram Corporation, Tulsa, Oklahoma, for the U. S. Navy. Heads and shell are 1⅛" thick. Revere was given the opportunity to collaborate with the Warner Lewis manufacturers on welding, which was successfully accomplished by the metallic arc process, using Inco 70/30 Cupro-Nickel electrodes. The vertical weld on the shell was X-rayed 100% and found satisfactory to pass Navy inspection. Because of the thickness of the metal, it was decided to form the heads hot at around 1690° F. The forming was done by the Hackney Iron & Steel Co., Enid, Okla., which also consulted with Revere.

Warner Lewis Company of Tulsa, with representatives in 30 cities, are specializing on all types of alloy design and fabrication and inquiries of this nature are invited.

If you wish information regarding the selection, welding, or working of copper and its alloys and aluminum alloys, see the nearest Revere Sales Office.

Completed aviation gasoline filter, made of 90/10 Cupro-Nickel

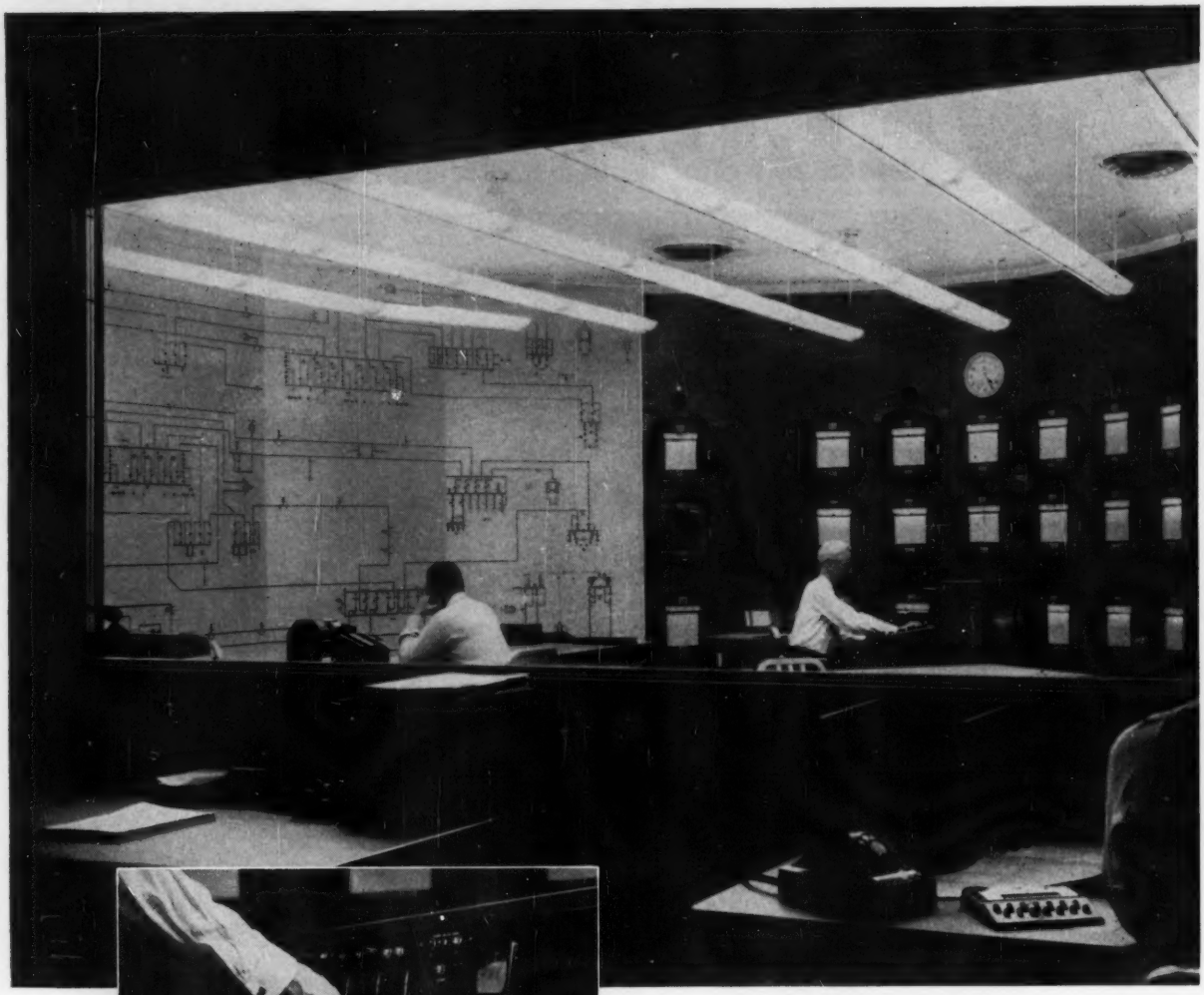
REVERE

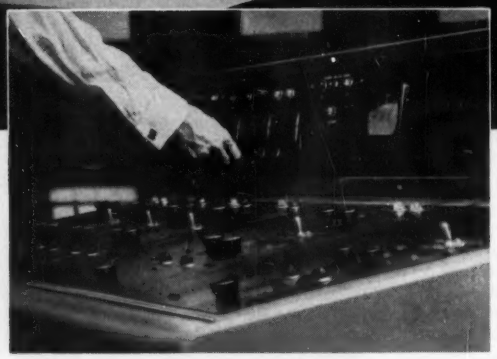
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N.Y.

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.



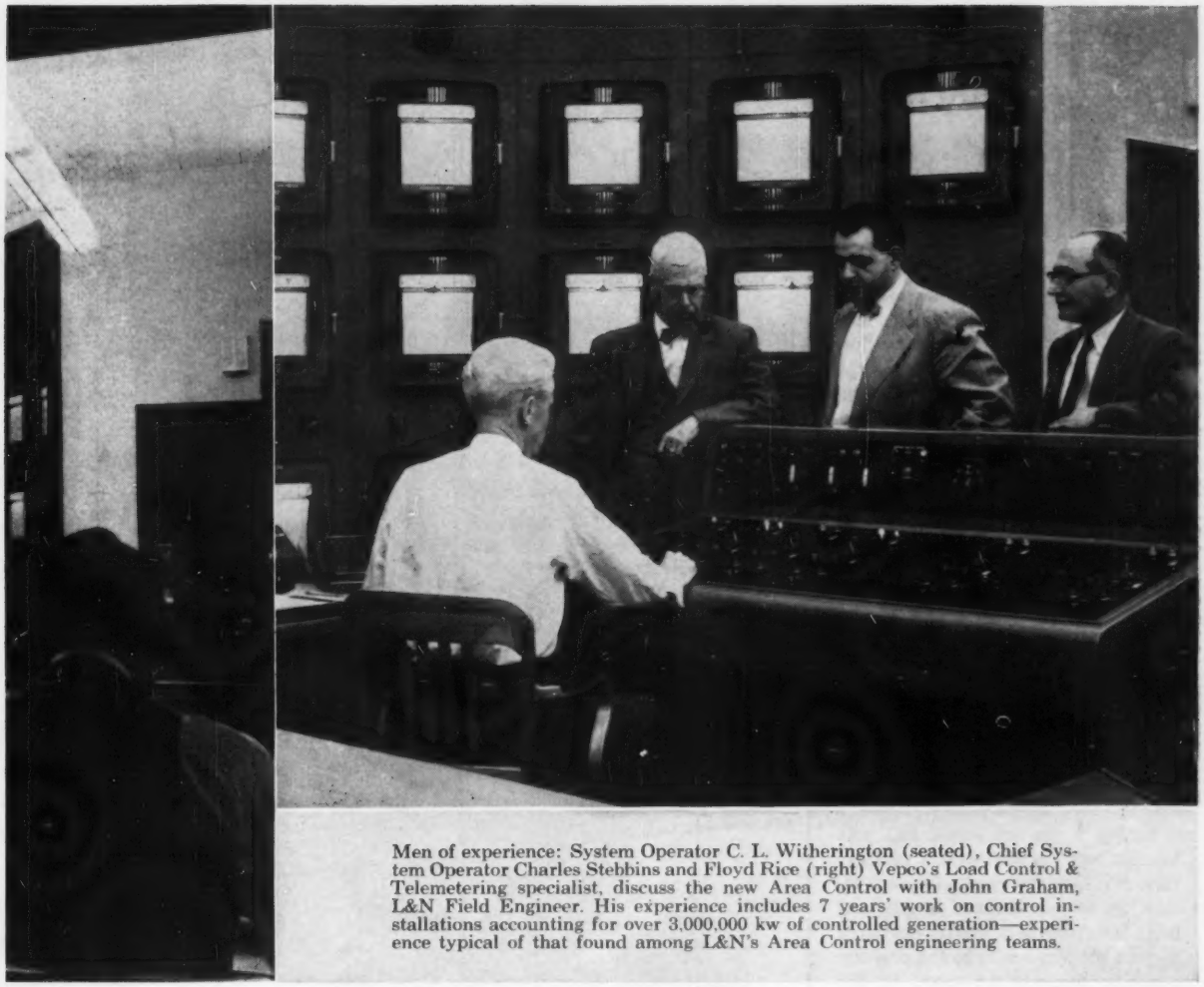


Virginia Electric & Power Co.

This progressive utility is one of many which are waging a push-button war on rising operating costs with the new Leeds & Northrup Area Load Control. Already, this new control has been installed on systems having a combined capacity of 40-*million* kw . . . about one-third of American generation, exclusive of industrial power. Actual performance shows that the new Area Control:

1. Provides full-time regulation. Under normal conditions, for example, 18 generating units in Vepco's service area are held on an economy loading schedule. When an operating upset occurs, the new control senses the upset and automatically initiates control action to aid the problem. When conditions return to normal, the control nudges units back to their lowest-cost-of-generation assignments. Result: the Vepco System Operator has automatic control when he needs it most. Savings? Although the answer depends on the characteristics of your system, may we suggest you discuss this point with your power neighbors who use L&N Area Control.

2. Permits smoothly integrated operation with your power neighbors . . . enhances fullest utilization of economy interchange. Vepco finds that their control contributes to a mutually beneficial "co-operating" relationship with the utilities surrounding their operating area. Control is particularly helpful in maintaining interchange schedules with two companies to which they are "tied" directly.



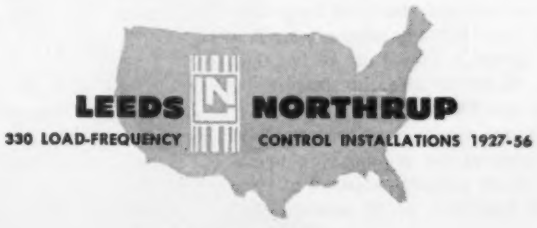
Men of experience: System Operator C. L. Witherington (seated), Chief System Operator Charles Stebbins and Floyd Rice (right) Vepco's Load Control & Telemetering specialist, discuss the new Area Control with John Graham, L&N Field Engineer. His experience includes 7 years' work on control installations accounting for over 3,000,000 kw of controlled generation—experience typical of that found among L&N's Area Control engineering teams.

joins 40-million kw trend to new automatic area control

3. Gives a complete answer to the dispatching problem. From his custom-engineered Area Control Console, the Vepco System Operator sees a complete panorama of centralized system operating data as it unfolds on precision Speedomax Recorders and Telemeters. Included are graphic presentations of the behavior of all 5 foreign ties and the output of 8 generating stations. Like all L&N Area Load Control systems, this one is designed to integrate with an L&N computer, when Vepco operations require.

The L&N men who stand behind this advanced control are load-frequency control career specialists who have solved many problems similar to yours. The same is true of the L&N engineering teams that translate your requirements into equipment.

Talk with these men about your operating cost problem. Let them show you why the modern L&N approach is so widely acclaimed—and what it can do for you. Contact our nearest District Office, or 4938 Stenton Avenue, Phila. 44, Pa.



Ground Wire Change Cuts Interference

Ground wire extension designs, developed and tested by the Rural Electrification Administration, U. S. Department of Agriculture, allow lightning to discharge safely over a distribution pole's surface, rather than through the wood. Design changes affect only the position of the ground wire and its ground wire clips or staples, near the pole top.

No changes below the neutral are called for.

Field reports and laboratory tests indicated that the location of the ground wire extension and its staples above the neutral on a rural line pole was a major cause of radio and TV interference. Moreover, it appeared that the ground wire extension had not always provided complete protection to the pole against lightning.

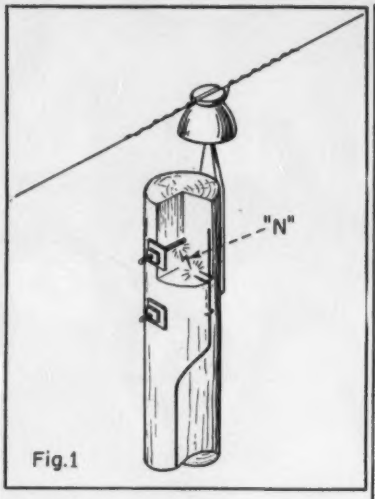


Fig.1

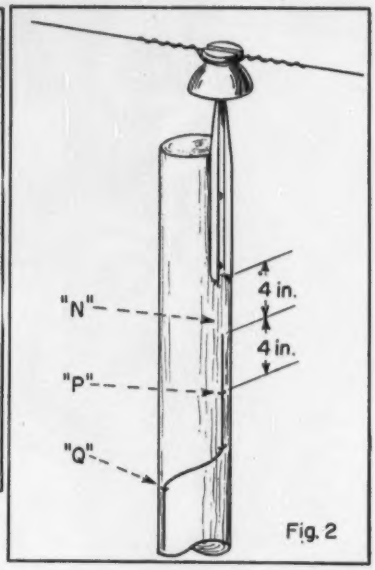


Fig. 2

DRAWINGS illustrate pole-line ground wire problems and the design changes developed as solutions by the REA

Clearance Is Small

In Fig 1 the top staple and pole top pin bolt are shown in a cutaway view revealing the small clearance inside the wood between staple and bolt. The path of lightning discharge is from the phase wire to the pole top pin bolt through the wood to the staple tips. The energy of the lightning surge often loosens the staple and blows small chunks of wood from the pole at "N." The result is radio and TV interference and a damaged pole.

Clips Recommended

The new ground wire extension design is shown as Fig 2. The ground wire is located to permit future use with a crossarm assembly. Otherwise it could be run in a straight line to the neutral. The 4-in. gap at "N" is a maximum. Any greater gap distance may result in gouging of the pole surface near the tip of the ground wire from lightning discharges. This gap, however, should not be less than 2 in., as smaller clearances may cause radio and TV interference.

Ground wire clips are recommended for securing the ground wire to the pole in the positions adjacent to energized hardware, as at position "P." Staples may be used for fastening at points below the clip, as at "Q." On this assembly the position of the clips is not critical, except for the top clip at "P" which should be approximately as shown.

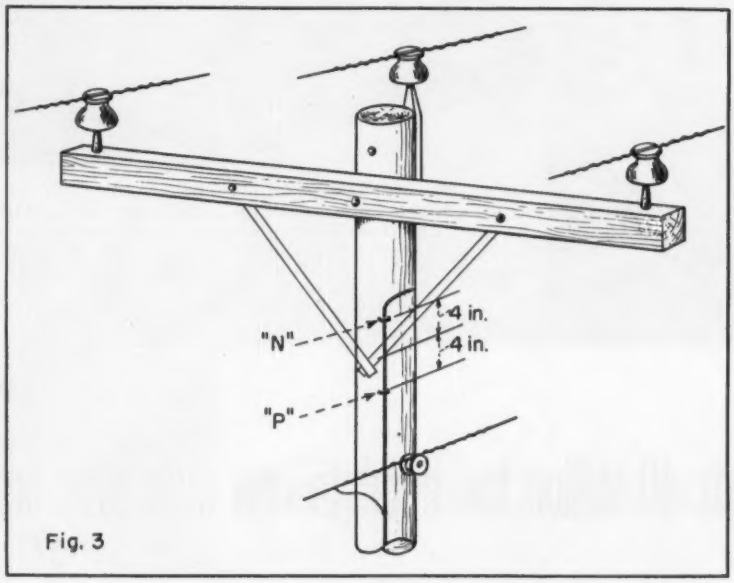


Fig. 3

Jump Distance 1 In.

Fig 3 shows the location of the ground wire and ground wire clips relative to the crossarm braces in a 3-phase crossarm assembly with pole pins .

Above "N" the ground wire is run around the far side of the pole as in Fig. 2. It is important that the ground wire clips at "N" and "P" be not closer to the crossarm brace lag screw than 4 in. There should be no other staples or clips between "N" and "P." The ground wire should clear the crossarm brace lag screw by about 2 in. measured over the surface of the pole. This will result in a jump distance through air from crossarm brace to ground wire of about 1 in.

(*More How To on page* 111)

Westinghouse
condenser bushings . . .

THE PRODUCT OF 50 YEARS OF EXPERIENCE

Originated by Westinghouse in 1907, the condenser principle of bushing design is today the standard of the industry. Proved through the years, this design adds substantially to the reliability of transformers and breakers and proves again that you can be sure if it's Westinghouse.

WATCH WESTINGHOUSE!
*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Westinghouse condenser design licks corona... radio interference problem

THE PRINCIPLE—Condenser construction provides uniform voltage stress throughout insulation radially, and over surface of bushing longitudinally.

THE DESIGN—A series of equal capacity condensers, spaced concentrically around the conductor, consists of alternate layers of aluminum foil and impregnated paper. Extremely thin, specially treated foil improves adhesion and electrical coordination. Continuous winding under carefully controlled conditions eliminates voids and variations in resistivity. Impregnation of supercalendered paper imparts unexcelled dielectric strength. Type "S" bushing resistance to moisture and tracking under dielectric stress is provided by baked varnish finish. Type "O" bushings are porcelain-enclosed and the condenser vacuum oil impregnated.

YOU BENEFIT—Smooth voltage gradient throughout bushing eliminates internal corona, radio and TV interference, insulation breakdown. Condenser principle design—most efficient ever developed!

Why specify Westinghouse condenser bushings?

Demands on power equipment today have reached astronomical proportions—breaker interrupting capacity to 25,000,000 kva—transformer capacity of more than 500,000 kva.

Only Westinghouse has the background—the know-how—the experience needed to successfully and consistently meet—and exceed—these demands. Why? Because only Westinghouse, who pioneered the condenser principle, has designed, built and improved condenser bushings for 50 years.

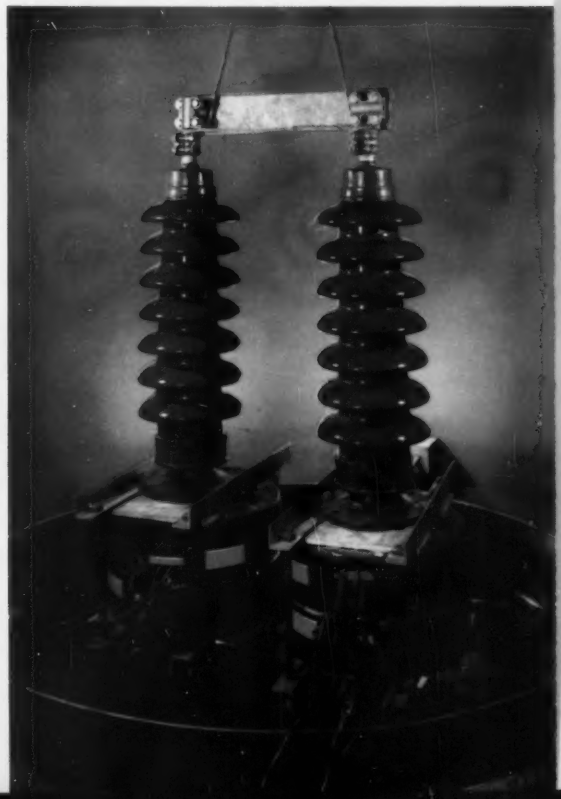
Service record of the Westinghouse condenser bushing is unexcelled. It has contributed to improved operating safety, greater service continuity and unmatched reliability. Industry recognition of this design has led to the new ASA standards for equipment voltages from 23 to 69 kv. The standard bushing is patterned after the Westinghouse Type "S".

The standardization committees will soon release standards for bushings in the Type "O" range and, again, the Westinghouse design will undoubtedly play a major role in the development of standards—*standards which are fully adequate.*

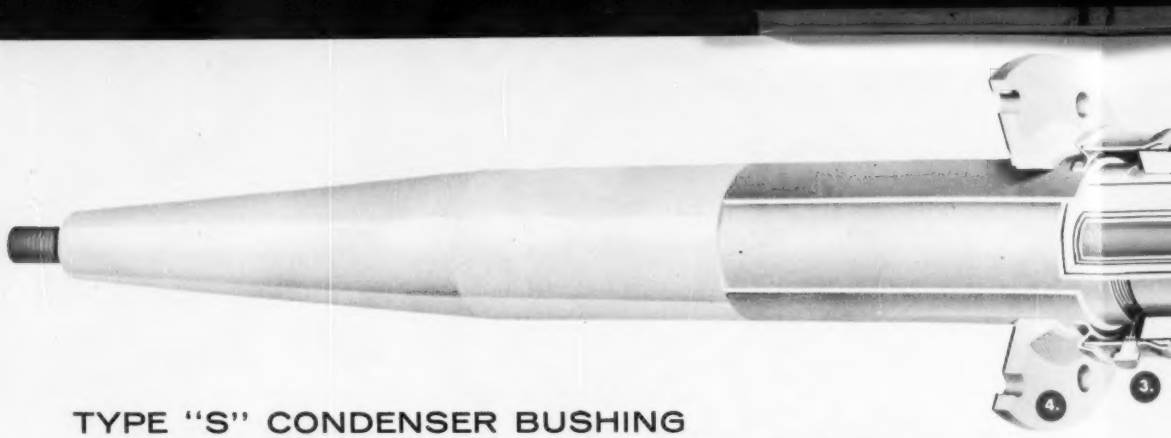
Shown on this page are a few of the many design tests given to Westinghouse bushings. They can pass these strenuous tests because no compromise is permitted in the quality or quantity of materials used.

Impulse tests—full wave and front-of-wave—at voltages far beyond standard test levels—*repeated hundreds of times*—failed to damage the bushings or increase power factor.

Work-worthy under any temperature extreme. In the Type "S" bushing, exclusive Westinghouse filler plastic eliminates voids at all points and at all temperatures down to 60° below zero F.



Bushing strength is undiminished during exceptionally severe thermal stability test. Test involves many hours' immersion in hot oil with full rated current circulation followed by an additional hour with twice normal voltage applied.



TYPE "S" CONDENSER BUSHING

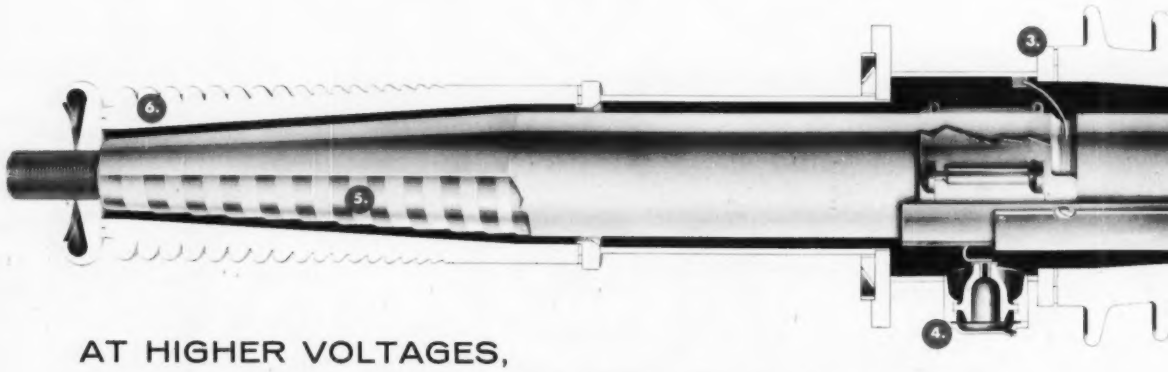
achieves highest strength . . . electrically, thermally, mechanically

With industry-wide bushing standardization, interchangeability for both transformers and breakers reduces spare parts stock requirements for voltage classes 23 through 69 kv and in current ratings up to 1,200 amps.

In addition to ASA standard characteristics, you can measure extra standards of performance in the many exclusive Westinghouse features shown here. **1.** ASA standard terminal stud. **2.** Between insulation and porcelain on the external end of the bushing, is an exclusive, high-viscosity filler plastic, which is impervious to moisture, prevents voids under all temperature conditions, and retains at all times a complete bond with all insulating members. **3.** Power-factor test terminal—originated by Westinghouse. **4.** ASA standard mounting flange. **5.** Continuous condenser foil layers—minimum dielectric heating, lower power factor, no insulation hot spots, overall high thermal capacity

Photo immediate right: Westinghouse-developed porcelain—a high-stren cast in one piece. Here is unit being removed fro

Photo far right: The ind gasketless bushing—all mounting flange to cap sealed, a Westinghouse offering a permanent m seal with greater m strength in cantilever.

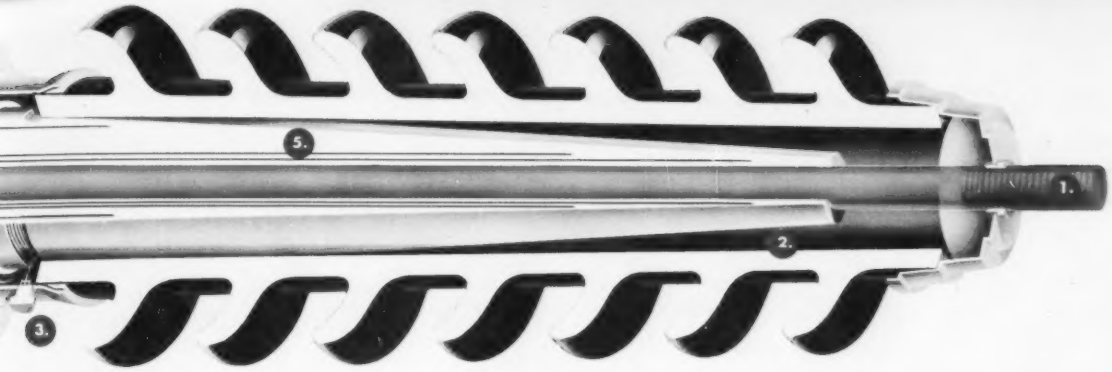


AT HIGHER VOLTAGES,

long-term dependability is assured with Type "O" Bushing

The Westinghouse bushing has more total insulation strength than bushings of any other design or type of manufacture. Vacuum oil impregnation of condenser insures insulation with the highest possible dielectric strength in a minimum of space. **1.** Compression spring assembly—spring cap applies tons of pressure to maintain tight seals on gasket joints; uses porcelain in compression where strongest. **2.** Inert gas space. **3.** All seals are double-gasketed—a hard, neoprene-asbestos outer stop gasket prevents over-compression of the resilient neoprene-cork sealing gasket. **4.** Potential tap—exclusive Westinghouse design preserves full bushing insulation strength at all times. **5.** Concentric foil layers. **6. & 7.** Completely porcelain encased.

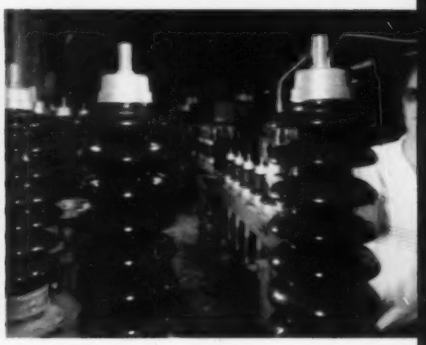
Photos at right: Use of semiconductor Coronox® tape, a Westinghouse exclusive, prevents corona at the ends of the condenser foil. Vacuum oil-impregnated conden to the mounting flange couplings, "floats" wit casing, eliminating stress. Type "O" and use an exclusive bondi tween conductor and copper and paper expa tract at different ra breaking the bond. winding under careful conditions eliminates v ations in resistivity.

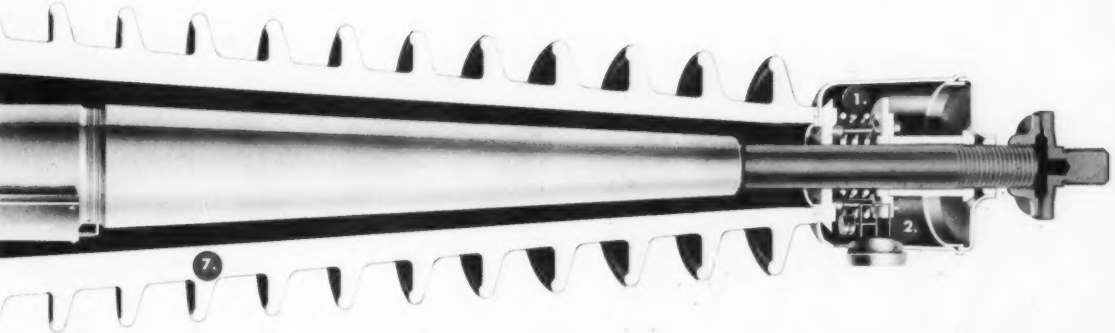


Westinghouse Type "S" Condenser Bushing for power breakers and transformers, 23 to 69 kv.

ally

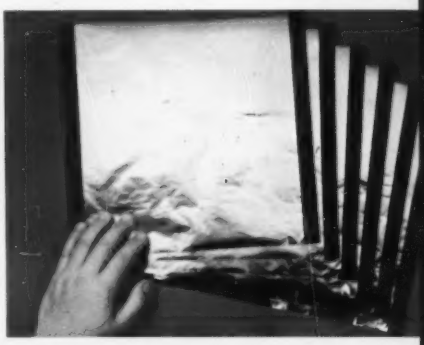
apacity.
right: Exclusive
eloped wet process
n-strength casing,
Here is a porcelain
ed from the kiln.
he industry's only
g—all joints from
to cap are solder
ghouse exclusive,
ent moisture-tight
ter mechanical
ever.





Westinghouse Type "O" Condenser Bushing, 92 to 330 kv, interchangeable between breakers and transformers for 20 years.

condenser, attached
flange with flexible
s" within porcelain
ating mechanical
" and "S" bushings
bonding agent be-
r and condenser—
er expand and con-
ent rates without
ond. Continuous
carefully controlled
ates voids and vari-
ity.

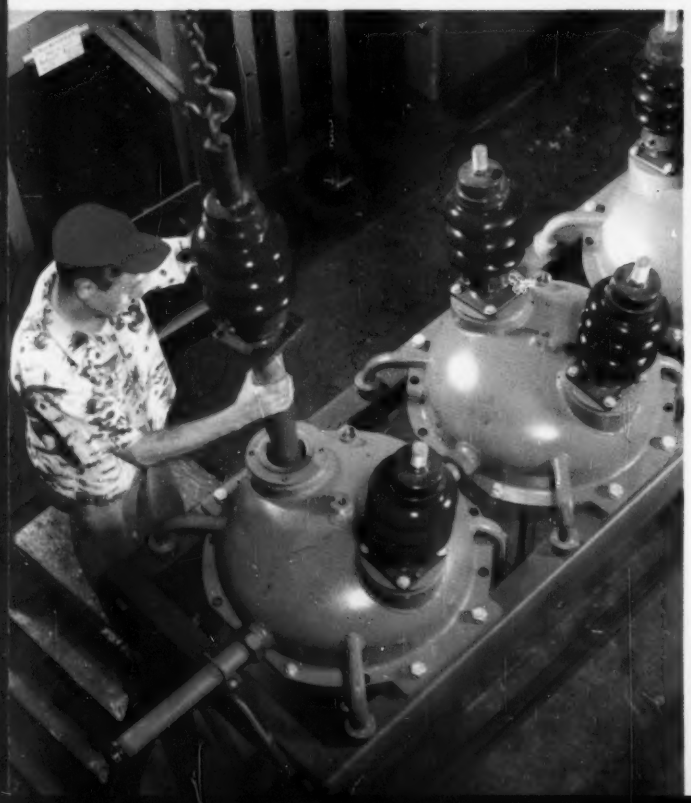


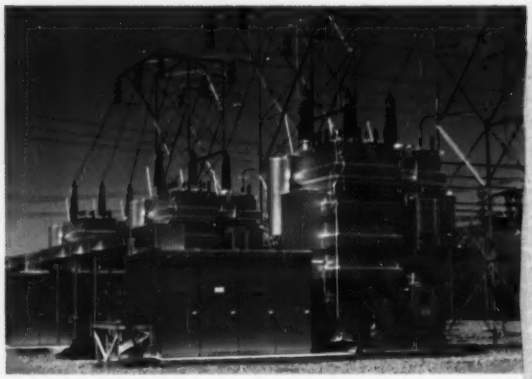
20 checks prove performance . . .
further insure longer bushing life

Twenty checks throughout the processing of bushings are your final safeguards for delivered quality . . . every time. Quality has been proved through 50 years of field service. More assurance of the utmost capability and reliability of Westinghouse high-voltage apparatus in offering service continuity to your customers.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*





A typical Westinghouse 10,000-kva substation transformer equipped with Westinghouse Type "S" standard ASA bushings.

Installation of standard ASA bushings on the new Westinghouse Type "G" power circuit breaker.

J-60893

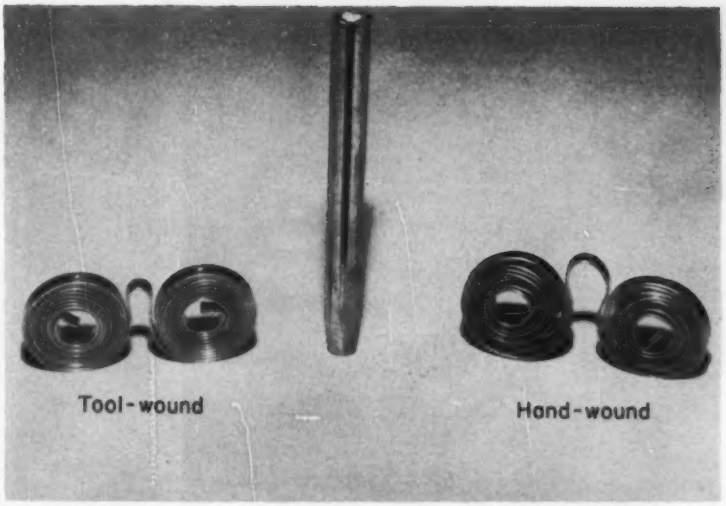
Tool Eases Connection

(*Continued from page 93*)

stick frees the carriage, and it moves upward with the force of the spring. Washers and nuts are installed with an end-on wrench stick. A rust inhibitor applied to the washers keeps them in position on the wrench socket over the nuts.

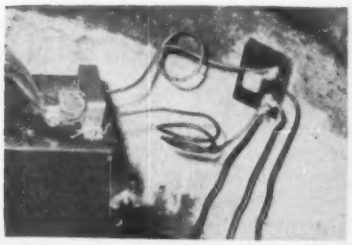
After the nuts are started, the clamp is released from the carriage by loosening the bent eye bolt nearest the operator with a tie stick. The carriage is held down against the force of the spring and locked in this position by tightening the set screw with a circular motion of the tie stick.

Bent eye bolts are also used in other tools for the installation of parallel groove clamps and smaller connectors of the split-bolt type.



TOOL WOUND RIBBON, left, is neater and tighter than hand wound ribbon, right

DISTRIBUTION—Testing



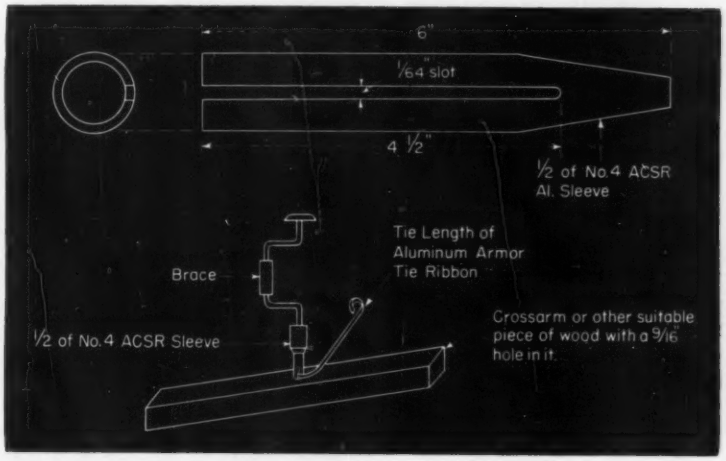
FIBER BLOCK installed just below the manhole cover eliminates the need for pumping out before testing the cables

Elevated Block Speeds Manhole Cable Test

ALBERT WHITE, Substation Department, British Columbia Electric Co, Vancouver, British Columbia

Test connections brought to the top of transformer manholes are speeding cable testing for electrolysis on the British Columbia Electric Co system. Elevated test connections have eliminated the considerable time and expense of pumping water from manholes in preparation for testing.

Connections from the cable are terminated on a small fiber test block installed just below the manhole cover. With the block installed, it is necessary only to remove the cover and attach the leads from the instrument to the terminals. Cost of mounting the block and making the necessary connections to the cable is estimated at $20 per manhole.



HALF OF A NO. 4 ACSR SLEEVE is flattened, slotted, tapered and fitted into brace. The other end of the sleeve is inserted in a piece of wood with a 9/16 in. hole and the ribbon is wound by turning brace

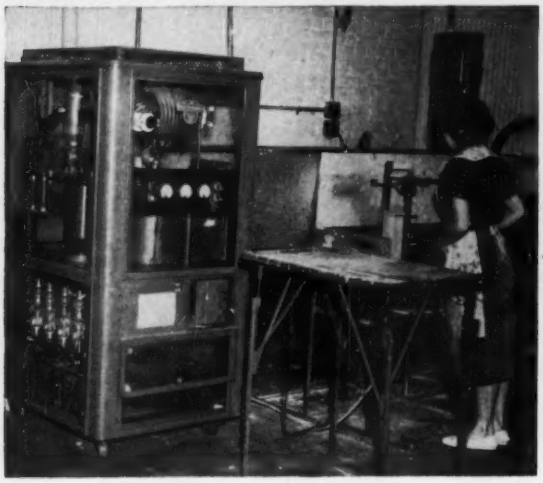
DISTRIBUTION—Construction

Simple Tool Coils Armor Ribbon Fast

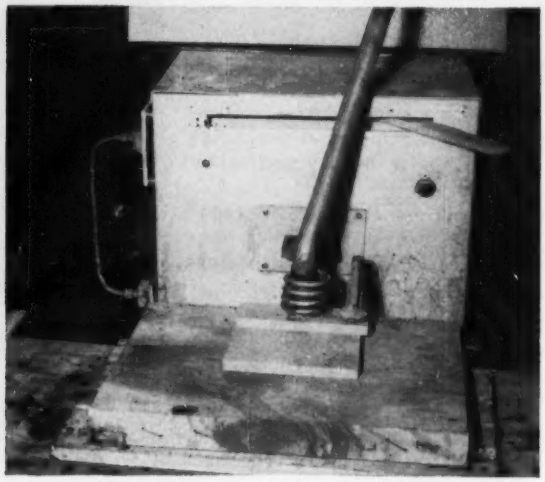
A simple tool, developed by Rex Norrie of the Consumers Public Power District, Columbus, Neb., coils aluminum armor ribbon quickly and easily.

One end of a No. 4 ACSR sleeve is tapered to fit into a brace, and a $\frac{1}{64}$ x 4½-in. slot is cut in the sleeve. This half of the ACSR sleeve is mounted in the brace and the other end inserted in a piece of wood with a $\frac{9}{16}$-in. hole bored in it. The ribbon is doubled in the usual manner and one end placed in the slot in the sleeve. The ribbon is then wound by turning the brace. The other half of the ribbon is wound in the same way.

This tool has several advantages over hand coiling. It gives a tighter coil, keeps the ribbon straight while coiling, and makes coils neater and much faster. A tight, evenly wound coil of aluminum armor ribbon makes a better tie. Such neatly wound coils are also more convenient to store and to handle on the job.



BRAZING OPERATION shows 20-kw, 400-kc induction heater used to join an insert to a heavy-duty lawn mower handle



10 KW INDUCTION HEATER supplies the heat for brazing a reinforcing sleeve into the end of aircraft engine fuel line

Induction Heating Hikes Tube Product Output

J. A. KRONER, Industrial Sales Engineer, Connecticut Light & Power Co, New Britain, Conn.

Induction heating solves many problems of the Tubular Products Co of New Britain, Conn., in manufacturing products as various as fuel injection, manifolding, and air-conditioning systems for the aircraft industry and frame parts for heavy-duty lawn mowers.

Induction heating has replaced hand torch methods for the numerous brazing and bending operations involved in turning metal tubing into a myriad of complex shapes. The older methods meant low production rates and many highly skilled operators.

Now, by changing coil shapes, the induction principle can be adapted to 80% of the operations that required use of a hand torch. Quality has gone up, there is greater uniformity of product, and rejects have decreased by 25%. And the better job is now accomplished in from a half to a third of the time formerly required.

The fact that the unskilled worker, who is easier to find and hire, can be taught quickly to load and unload the machines—thus releasing skilled labor for other jobs—is an added bonus to the company.

In one photo a 10-kw high-frequency generator is being used to braze a reinforcing sleeve into the end of an aircraft engine fuel line. A very thin strip of silver solder is wrapped around the sleeve, and both are slipped into the fuel line. The assembly is fluxed, placed in the heating coil, and 70 sec later the power cuts off and the brazing is complete.

In the other photo a 4-in. insert is being brazed to the end of a lawn mower handle. The insert will fit into the frame of the heavy-duty mower and couple the handle to the frame. A ring of solder is placed over the insert and handle, and the assembly is placed in a holding jig below the heating coil. The joint is completed in 13 sec by a 20-kw induction heater.

These two simple applications of high-frequency heating exemplify progressive management's use of new and better production techniques.

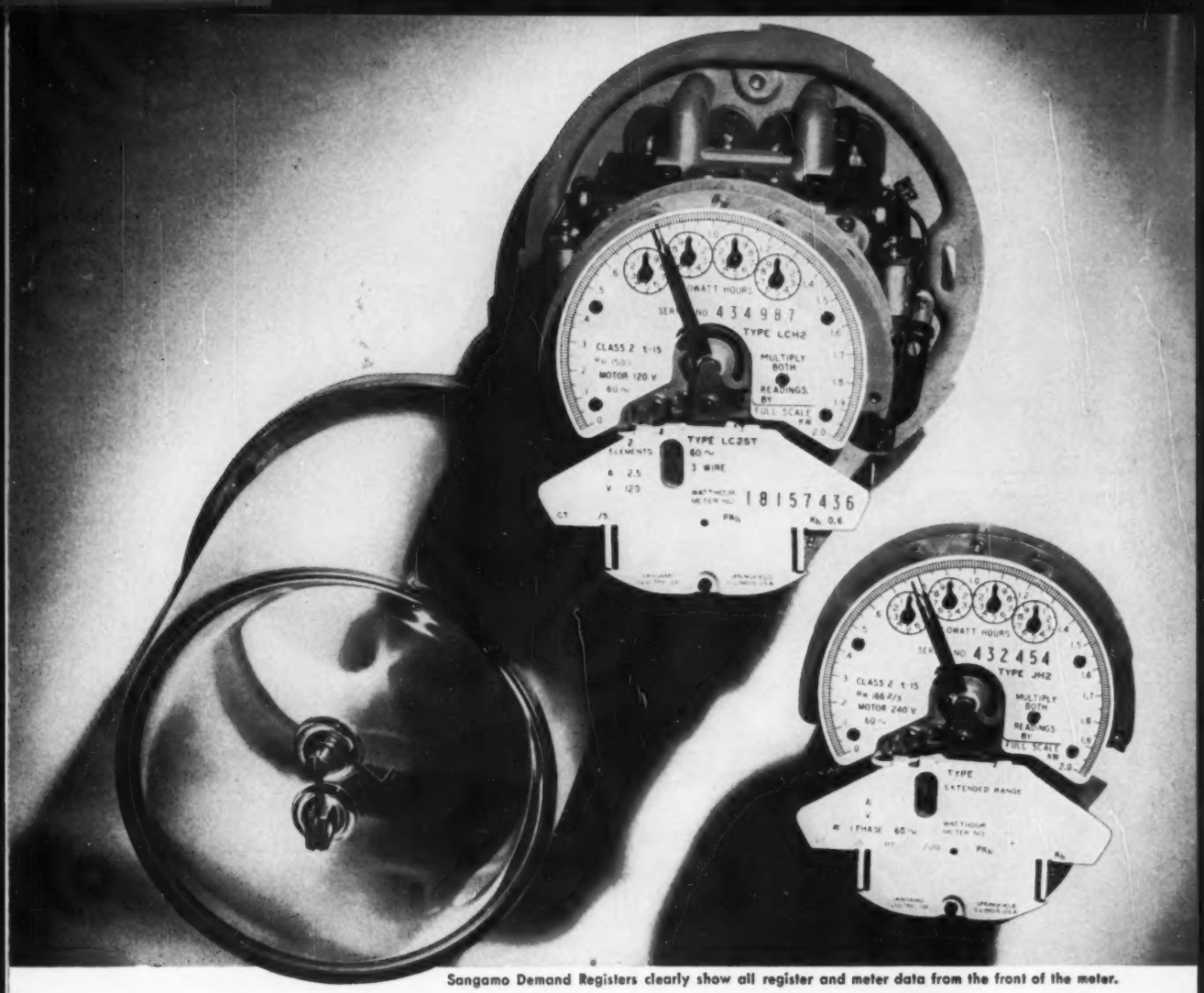
Electrostatic Spray Cuts Finishing Cost

J. H. GOODYEAR, Vice-President, J. W. Rex Co, Lansdale, Pa

An automatic, electrostatic spray finishing system has boosted production of small metal products and effected marked economies in time, labor, and material for the Del-Val Finishers Division of J. W. Rex Co, Lansdale, Pa. The new Ransburg sprayer produces good, uniform mil finishes, with coverages as high as 400 sq ft per gal. In contrast, the previously used hand method averaged about 200 sq ft per gal, with inevitable variations in coating thickness.

The spraying system consists of Binks No. 20 automatic type guns and a 130-kv Ransburg No. 1 power pack. This combination was selected because it can accommodate a wide variety of work and is extremely versatile.

On a typical job the production rate jumped from 250 to 375 pieces per hr, accompanied by a 50% decrease in labor and overhead costs and a two-thirds cut in amount of paint used. The electrostatic attraction plus a rotating work holder insures complete, even coverage of both exposed and recessed surfaces. Although touch-up time is cut sharply, the finished product is superior to that obtained by the old method.



Sangamo Demand Registers clearly show all register and meter data from the front of the meter.

for low-cost mechanical demand metering use SANGAMO Demand Registers

- **Mechanical Demand Registers... both singlephase and polyphase.**
- **Can be field-installed on any modern Sangamo Watthour Meter.**
- **Require no lubrication. No preventive maintenance problems.**

Any modern Sangamo Watthour Meter can be quickly converted to a demand meter by replacing the standard register with a Sangamo Demand Register.

Sangamo Demand Registers are built to give many years of consistently accurate readings. Service experience has proved them capable of extremely long periods of troublefree operation.

This long service life is due to: 1. The Sangamo slow-speed (450 rpm), high-torque motor. 2. Timing gear shafts with hardened, polished stainless steel pivots which turn in vacuum-impregnated porous bronze bearings. 3. The use of jewelled and nylon thrust bearings. 4. The dependable, clutch-free gravity reset mechanism.

For more information, write for Descriptive Bulletins 311 and 312 and for Service Manual 390

Live Better Electrically

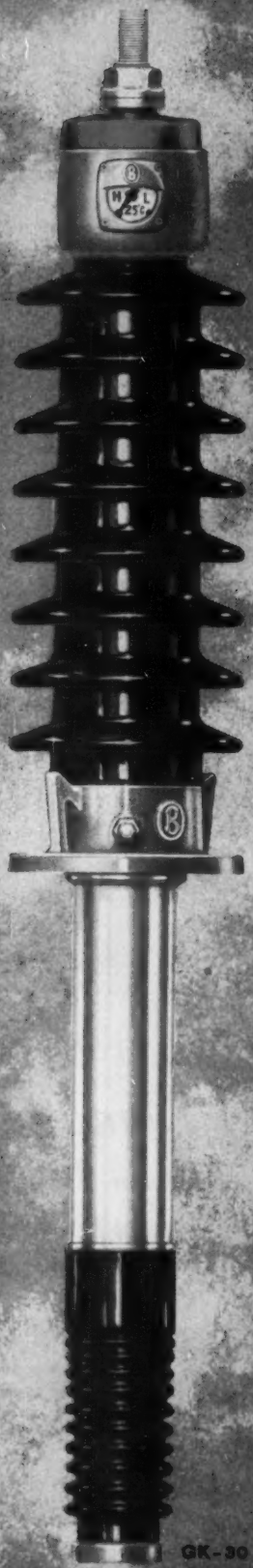
SANGAMO

SANGAMO ELECTRIC COMPANY

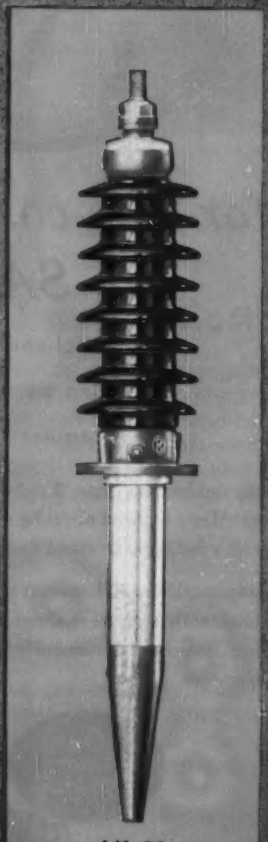
Springfield, Illinois

SM56-9

this is the you



GK-30



LK-30

new bushing asked for!

• Fully Meets ASA Standard at 69 kv
• Oil-Filled from End to End

You may be one of many people who insist on having a 69-kv bushing with these characteristics:

- Modern condenser-type design.
- Full adherence to ASA Standard, including standard interchangeable dimensions.
- Oil-impregnated insulating core, completely enclosed and completely oil-surrounded from end to end.

The foregoing are the *industry requirements* met by the new O-B Type GK-30 bushing. It also meets the all-important special requirement of living up to O-B's 50-year reputation for absolute dependability.

Other users prefer bushings of 69-kv rating having a condenser-type core insulated with polymerized, resin-coated paper. This class is represented by the LK-30 series. This group likewise meets all details of the ASA Standard.

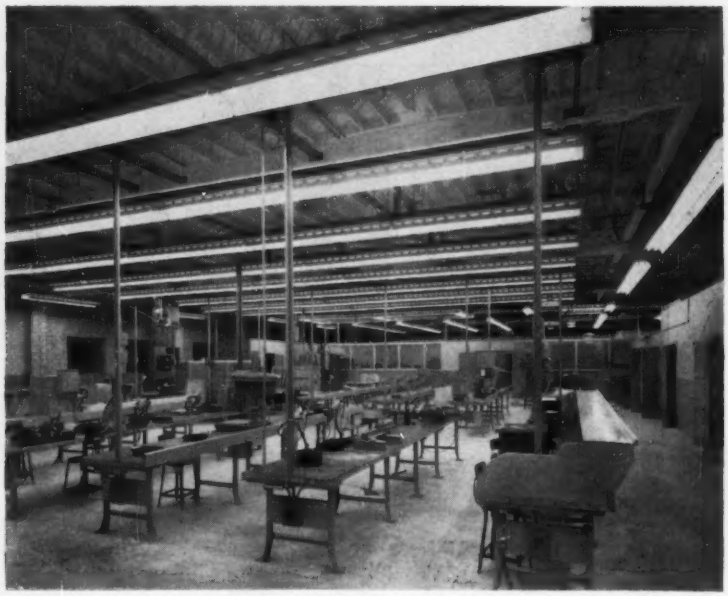
With either type, you have the protection of O-B's long-proved capability in the bushing field.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

MANSFIELD OHIO, U. S. A.

4647-H



90-FT-C SHADOWLESS LIGHTING in 2,200-sq ft assembly areas for miniature and subminiature electronic components assures efficiency without straining eyes

Good Light — Quality Miniaturized Parts

Good industrial lighting plays a critical role in the production of miniature and subminiature electronics equipment. Assembly tasks require the best and brightest practicable illumination consistent with eye comfort.

Recognizing this, Cornell-Dubilier Electric Corp installed a high-level lighting system in its West Coast plant at Venice, Calif. Company officials felt good light was necessary for the engineering of new electronic developments for national defense and for the manufacture of its standard line of capacitors and related electronic equipment.

For eye comfort, slotted industrial reflectors and a white ceiling reduce brightness contrasts considerably, creating a comfortable working atmosphere. In addition, the fixtures contribute to easy maintenance. Dust in the convecting air tends to accumulate on top of the reflectors instead of on lamps or reflecting surfaces.

Lighting Tailored to Need

The office area gets 35 to 50 ft-c from ceiling mounted, louvered fixtures. Laboratory light levels of 50 ft-c are obtained over a 22 x 40-ft area served by three rows of four fixtures. In a screen room area, completely shielded by double thicknesses of small mesh copper, the lighting level ranges from 5 to 7 ft-c.

A 14 x 25-ft area used for can fabrication receives 100 ft-c from a nine-fixture (10 x 12-ft) grid system mounted 12 ft high. The 12 x 12-ft machine shop area uses a four-fixture grid pattern for 80 ft-c. The 42 x 52-ft assembly area is served by nine five-fixture rows on 6½-ft centers, yielding 90 ft-c of shadowless light for efficiency and easy vision.

Cornell-Dubilier has developed intricate coil-winding devices for accurate production of capacitors. The 9 x 36-ft winding machine area is lighted to 100 ft-c by a 6 x 10-ft grid system.

In a separate coil impregnating room, high level lighting is not required, but occasionally fumes and particles may cause fixtures to become dirty and less efficient. This 1,600-sq ft area is lighted by 14 diffusers, using 200-w incandescent lamps.

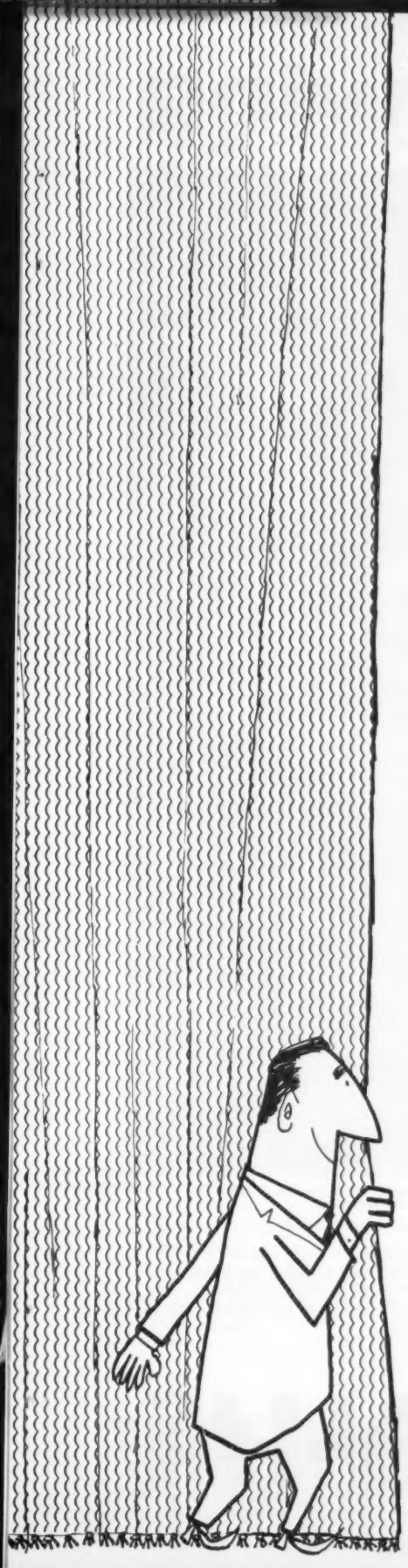
Circulation areas are lighted to 20 ft-c, and the shipping and receiving area to 25 ft-c.

INDUSTRIAL BRIEFS

Electric heat pumps enabled the First Federal Savings & Loan Assoc of Marion, Ind., to air condition its two-story office building. Two 5-ton units, each occupying 10 sq ft, automatically heat, cool, dehumidify, and ventilate the 4,400-sq ft building, changing its 40,000 cu ft of air about seven times an hr. Installation cost was $10,000, compared with an estimated $13,000 for other fuel methods. Estimated operating costs are $700 annually, against $900 for heat alone with the old system. Added advantages are lower maintenance and individual temperature control for each of the two floors.

A well-planned, plug-in bus duct distribution system helped C. H. Dexter & Sons, Inc, specialty paper makers of Windsor Locks, Conn., modernize 100-year old plant facilities and cut operating costs simultaneously. Because papermaking is a continuous operation process, even a short, unexpected machine failure can cause costly losses in broken sheets, clogged beaters, and rejects. Realizing the advantages of a safe reliable electrical system for a modern economical plant, the company installed a 600-amp bus duct in one building in 1946. The main building was modernized in 1950 with a 1,600-amp duct, with take-offs at 1,500, 1,000 and 600 amp. In a two-story, 60,000-sq ft addition completed last year, four 500-MCM cables, supported by overhead racks, feed a modern distribution board. From there an 800-amp bus duct feeds the new made-to-order paper machine and a 225-amp duct the loading dock. Since the bus duct installation, failures are almost non-existent; and breakdowns because of cable faults no longer occur. F. W. Riggs, Industrial Sales Engineer, Connecticut Light & Power Co, Thompsonville, Conn.

Baking enamel finishes with an infrared radiant oven has stepped up production, cut space requirements and costs at the International Harvester Co's Richmond, Ind., plant. The new oven, only 11 ft long, bakes the parts in 11 minutes; the convection oven formerly used had a 1-hr cycle and took 480 sq ft of floor space. Better heating, baking, and drying results, with lower first cost and maintenance are also claimed.



Coming Soon... January 7, 1957!

Electrical World

THE NEW ELECTRICAL WORLD

"The electrical industry's weekly magazine"

TO MEET A NEED . . . for increased communications within the electric power industry, **Electrical World** drops alternating "regular" and " news" issues and goes to a regular weekly publishing cycle.

FULL EDITORIAL "BALANCE" . . . a completely rounded-out reader service each and every week, 52 weeks a year—in **World's** busy news pages, technical coverage, information and statistical reporting.

READER-TESTED FEATURES . . . a new series of the "Special Reports" that have had such spontaneous reader endorsement because of their timely, "trouble-spot" help — *Distribution Design Trends, Steam Station Cost Survey, "The Heat Storm,"* as well as *"Your Business"* and **World's** *"Live Better Electrically"* report.

IMPROVED STATISTICAL REPORTING . . . an area pioneered by **Electrical World's** editors with such works as the *Annual Electrical Industry Forecast* and the Annual Report, *"Electrical Industry Statistics"*—now of greater reader-value with the *"Electrical Business Outlook."*

A LOOK AHEAD . . . a new weekly "package" of everything World readers need to keep in stride with continued industry growth, as the nation learns more about . . . "Living Better Electrically!"

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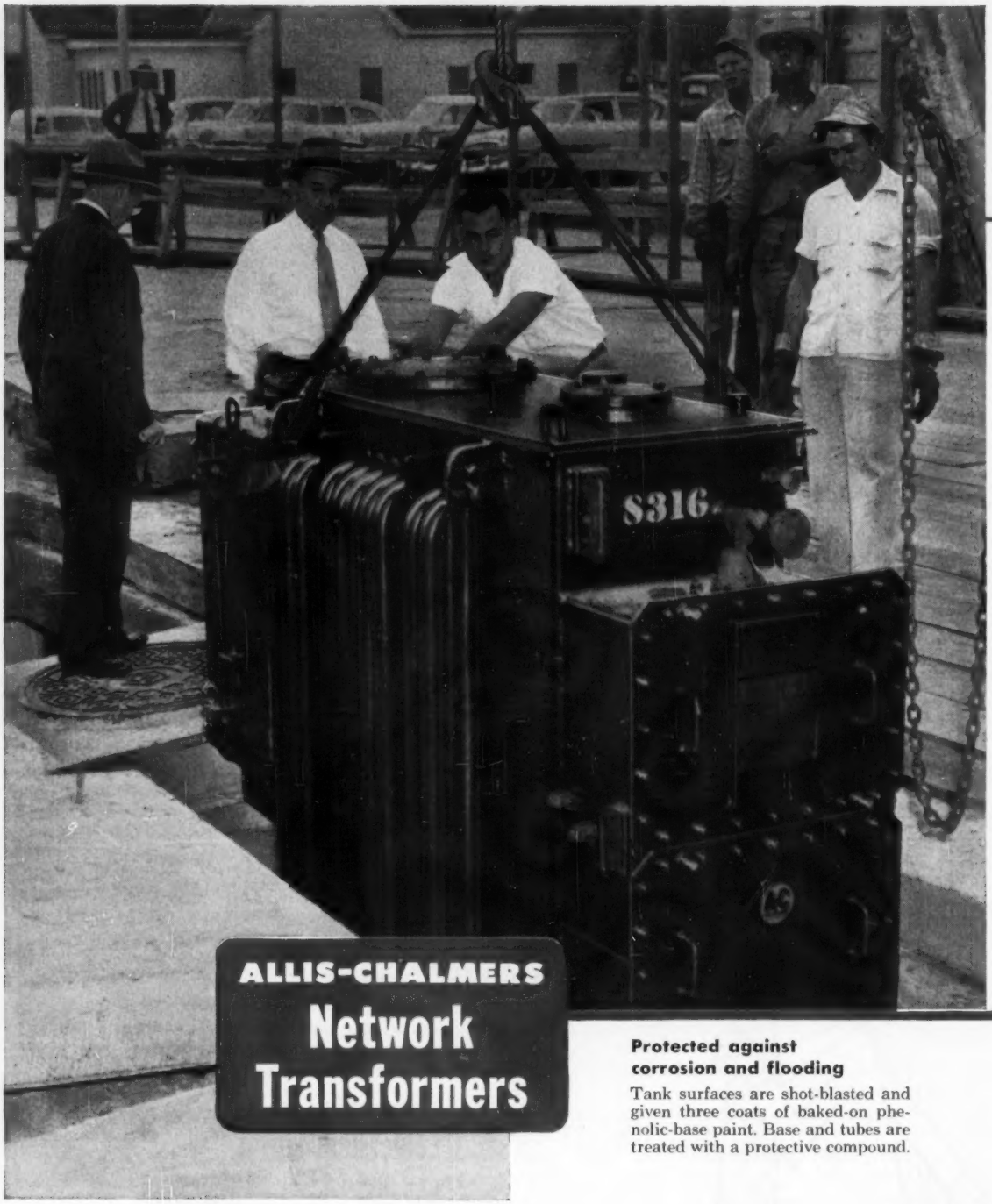
ABP ABC

To meet growing



ALLIS-CHALMERS
Network Transformers

Protected against corrosion and flooding

Tank surfaces are shot-blasted and given three coats of baked-on phenolic-base paint. Base and tubes are treated with a protective compound.

ALLIS-

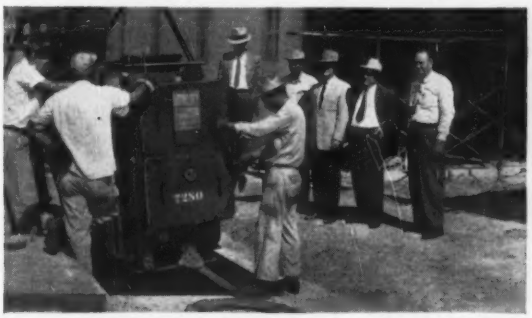
system needs

. . . in
Corpus Christi,
Texas

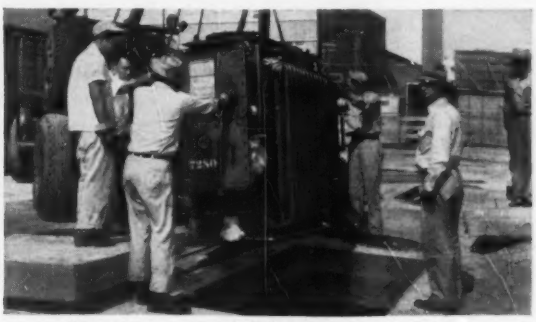
Central Power and Light Company Installs Allis-Chalmers network transformers for its own office building

As a utility, Central Power and Light Company has had the opportunity to observe and compare the performance, reliability and maintenance advantages of many makes of transformers. An application of Allis-Chalmers network transformers *at* CP&L's office building is shown here.

If you are planning to modernize or expand your network systems, investigate the many advantages of Allis-Chalmers transformers — advantages that have merited the complete confidence of Central Power and Light Company and utilities everywhere. For all the facts, contact your nearby Allis-Chalmers representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



Up goes another building in bustling Corpus Christi.



Down into the vaults go Allis-Chalmers network transformers.

High thermal capacities

Liberal ducts throughout both the high voltage and low voltage coils assure ample circulation of cooling liquid.

Special design of bushing seal

Spiral-wound metallic gaskets adjust to changing operating conditions. Can be installed without grease or cement.

Major gaskets eliminated

Main cover and switch compartment are welded to tank. Oil sludging and oxidation of insulation are held to a minimum.

CHALMERS

A-C ALLIS-CHALMERS

A-5198

Tampa's Leach, Georgia's Browder, Vepco's Anderson—Their aim:

How to Net More Kwhr per Kw

One way: Heat pump and space heating. Dixie's desire for balanced loads, better net return gives them a featured spot at SEE conference

Down in Dixie utility salesmen this year are taking a closer look at ways to pull more kwhr use from every single kw they sell. High summer demands are becoming more than ever a source of concern. They want to push the loads that promise better load balance and better net return.

To them, electric heating and the heat pump look good. Both loads got a lot of attention last month at the Southeastern Electric Exchange's annual sales conference.

The South is probably the most advanced of any region in its market development of the two loads. Alabama Power Co says one out of every 25 net homes contracted for this year will be electrically heated or heat pump equipped. Two-thirds of all the heat pumps in use in the country are said to be below the Mason-Dixon line. Georgia Power Co hopes to install more than 2,000 kw of commercial resistance heating this year. Florida Power Corp claims to have the highest concentration of heat pumps on its lines of any utility in the nation.

"To let cost stand in our way in the sale of electric heat is a folly that we cannot afford," J. B. Browder, Georgia Power Co, told SEE. "The economic jump from open grates to the parlor stove to central heating was more in each case than the jump we are taking to electricity."

Great Commercial Market

Harry T. Yopp, also of Georgia Power, pointed to the commercial market for space heating. "If only one-fourth of our company's large commercial customers (over 1,000 kwhr per month) were heated electrically with an average 20 kw each, it would add 133,600 kw and annual revenues of $3 million a year." Yopp's reasons why utilities should promote commercial heating:

1. Air conditioning loads are balanced as facilities for serving these loads are used all year.

2. When commercial customers use space heating, the home market becomes easier to sell.

3. Space heating is profitable in itself and, like lighting and air conditioning, can be used by virtually all commercial electric customers.

To get electric space heating started, Stuart Forsyth, Westinghouse Electric Corp, suggested this plan of action: Fix responsibility, educate all employees, alert all manufacturers, sponsor trade meetings, inform the public.

The commercial heat pump likewise can represent "some mighty important business to the utility," declared H. L. Cushing, Appalachian Electric Power Co. Appalachian now has 42 commercial and industrial customers with heat pumps totaling 1,170 hp, of which 975 hp are custom built jobs. Toughest problems, Cushing said, in selling commercial heat pumps:

1. Getting architect or consulting engineer to consider them.

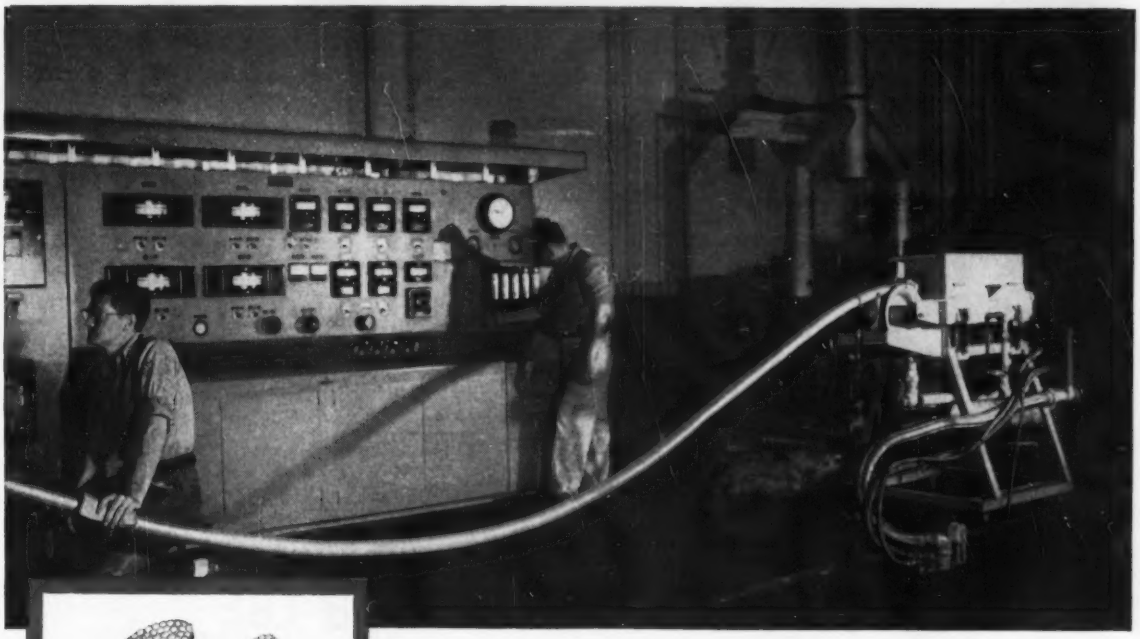
2. Reaching the national firms who figure in a large part of local store construction.

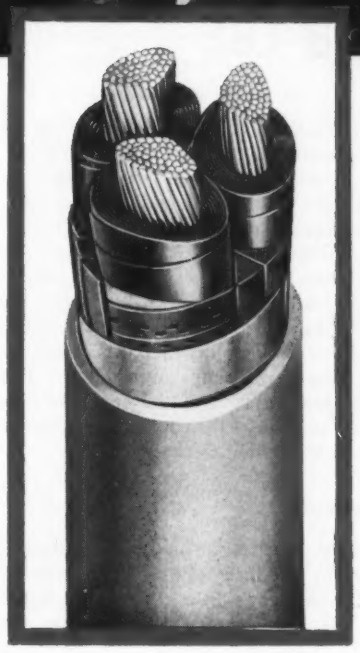
3. Getting to the prospect early enough.

Cushing stressed sale of the custom built heat pump as one way to improve load factor. Problems in their

(*Continued on page* 124)

ROEBLING INVESTS IN YOUR FUTURE





New continuous lead extrusion press vastly improves "paper and lead" cable sheathing

THIS NEW CONTINUOUS LEAD EXTRUSION PRESS and control board revolutionize the extrusion of sheathing for Paper Insulated Cable. Because its operation is continuous there are no press stops, no recharging and, of outstanding importance to you, *there are no charge welds.* In addition, the control board, shown at the left, automatically controls and records all temperatures. Every inch of the resultant cable is just like every other inch...the "paper and lead" cable sheath is perfect in its concentricity, physical properties and general uniformity.

This press is the finest obtainable today. It is only part of Roebling's program of modernization for producing electrical conductors of modern, high quality.

Our engineering and metallurgical staffs are always glad to consult with you on your individual cable problems. A letter or phone call will bring action.

ROEBLING ELECTRICAL WIRES AND CABLES ARE AVAILABLE WITH EITHER COPPER OR ALUMINUM CONDUCTORS

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With trips to ball games and . . ."Electro-bucks," here, are . . .

20 Ways to Get Dealers Aboard LBE

Dealers in the Columbus & Southern Ohio Electric Co area are hopping aboard the Live Better . . . Electrically band wagon in numbers rarely seen before in the company's long history of promotions.

The reasons: A high-powered "Electro-buck" incentive plan backed up by 20 valuable and realistic sales helps Columbus & Southern offers every dealer who joins its Electrical Living Dealer program. The helps:

1. In-warranty range service, whereby the company furnishes labor-free in-warranty range service on ranges sold by dealers and installed on the company's lines.
2. Demonstrations by the company's home service advisor in the dealer's customers' homes.
3. Demonstrations by home service advisors at home parties, store openhouse parties, group meetings, fairs, exhibits, and shows.
4. Temporary hook-ups of range installations in the dealer's store.
5. Development of prospects at group meetings.
6. Decals, banners and other identifying materials to indicate affiliation with the national LBE program.
7. Direct mail advertising of appliances.
8. Free display material for windows and store interiors.
9. Local interest stories, articles and pictures on electric living for newspaper publication.
10. Newspaper advertising.
11. Radio and TV advertising.
12. Appliance displays in company store and show windows.
13. Sales training help for dealer salesmen.
14. Trained personnel to help dealers close sales.
15. Area representatives and home service advisors to make customer calls.
16. Dealer representatives to help dealers set up and carry out their programs.
17. Special campaigns to promote electrical living.
18. A bi-monthly dealer sales bulletin.
19. Kitchen and laundry planning service.
20. Drop-in mats for campaign use.

It's the "Electro-buck" plan, however, which puts the hair on the chest of the Electrical Living program. One hundred "Electro-bucks" are awarded dealer salesmen for every sale of an electric range, dryer, water heater, and air conditioner. During special campaigns additional "Electro-bucks" are awarded for sales of the appliance being promoted. They are printed by the company and redeemable only by its Sales Promotion Department.

Sports and Appliances

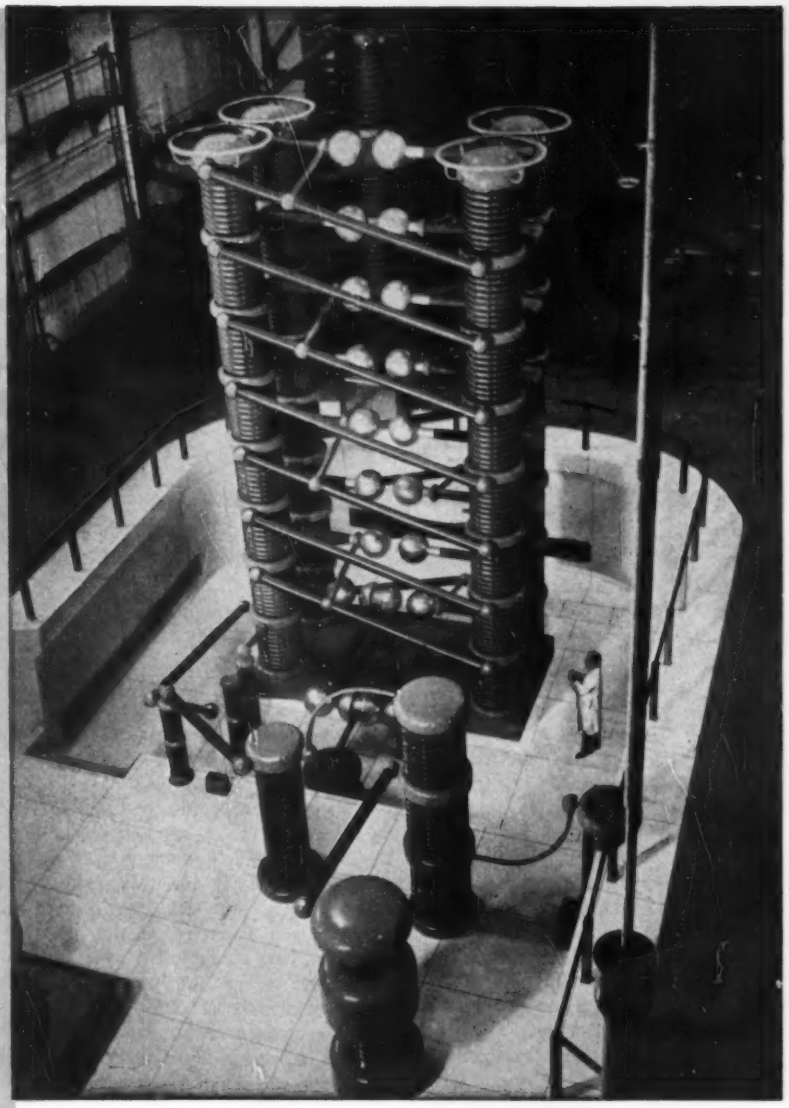
"Electro-bucks" are redeemed in several ways. Buses or trains are chartered to take lucky salesmen on baseball or football trips. The company's Sales Promotion Department handles all the arrangements. Salesmen pay their fares with "Electro-bucks".

"Electro-buck" prices for trips are varied to keep the out-of-pocket cost to the company commensurate with the load building results obtained. One recent jaunt, via chartered bus, to a Sunday ballgame in Cincinnati pulled 200 qualifying salesmen. The company furnished the transportation, tickets, dinner, and refreshments. This fall a trip is planned to an out-of-town football game. An equally large crowd is expected.

Salesmen who do not win enough "Electro-bucks" for the big trips select prizes from a long list of electrical appliances, each carrying an "Electro-buck" price tag.

Transformer Capacity of over 5,000,000 kVA per annum

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft., has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.



National Physical Laboratory

This Ferranti Impulse Generator at the National Physical Laboratory, Teddington, England, by whose permission the photograph is reproduced, generates 3,200,000 volts and has an energy rating of 77 kW seconds. This is a typical example of the type of A.C. and D.C. equipment manufactured by Ferranti Ltd., for routine and research testing.

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HEATPUMPERS Angier, Warren Cheatham, O'Neill, and Brasfield: More plans for the Southeastern market where two-thirds of all heat pumps already are in use

More Kwhr per Kw (*Continued from page* 120)

design and use were discussed by Westinghouse's Milton S. Angier.

Charles T. Brasfield, Alabama Power Co, noted that with increased emphasis on higher lighting levels and increased wattage plus other sources of internal heat, the architect or consulting engineer often finds the heat pump an ideal solution. "In many instances," he said, "the internal heat loads will either supply all or the major portion of the supplemental heat required."

As the "All-American" of the heat pump selling team (manufacturers, distributors, and dealers) the utility, said Paul O'Neill, General Electric Co, must spark plug the games with the local "gas house gang" by:

1. Providing advertising funds, layout assistance, and tie-ins.
2. Offering customer service and engineering layout assistance.
3. Employing sales specialists.
4. Setting up displays at offices, stores, exhibits, and fairs.
5. Informing employees and instigating aggressive heat pump action.
6. Offering subsidy programs for employees and customers.
7. Developing "use the user" programs.
8. Assisting in training programs.

Backing him up was Gilbert D. Leach, chairman of SEE's Heat Pump Promotion Subcommittee. Leach divides promotional activities into two plateaus.

For utilities just beginning promotion he suggests:

1. Train one or more heat pump specialists.
2. Install and demonstrate heat pumps in company offices.
3. Get a number of reliable air conditioning contractors to sell and serve heat pumps.
4. Collect operating, installation, and maintenance data and use as a sales tool.
5. Start limited newspaper, trade magazine advertising and articles. Make direct mailings to selected prospects, encourage tie-in ads by dealers.
6. Educate company employes.

For utilities that already have 50 or more heat pump installations, he suggested a step up in manpower, heat pump contractors, and advertising. "Start hitting architects, engineers, builders, and financial institutions," he said. "Start an incentive plan for contractors to sell heat pumps over conventional systems. Set up special purchase and finance plans for employees. Use the user for testimonials and continually check on service."

Heat Pump or Resistance?

Summing it up, E. A. Snyder told how American Gas & Electric Co approaches the electric house heating and heat pump markets: The heat pump for custom-built homes and commercial buildings, resistance heating for low-cost housing. "By selling the idea of heating with electricity, we are building customer acceptance for a future heat pump market when prices will make it possible for us to hit the total home market," he explained. At the end of August the AG&E companies had 5,932 electrically heated homes. Their goal this year is to add 2,500 resistance home heating customers and 250 residential heat pumps.

AW for Stores

Commercial-institutional wiring promotion set for '57 push by NAWB

A new and separate adequate wiring program—this one aimed at commercial buildings and institutions—will make its bow in 1957.

Sponsor is the National Adequate Wiring Bureau which says it will "enlist the support of all branches of the electrical industry and will furnish promotional materials necessary to help utilities and contractors sell better wiring in business establishments and public buildings."

Need for such a program has been felt for a long time, says NAWB. In 1955 the bureau broadened its scope to include commercial and institutional wiring promotion. Earlier this year it allocated funds to make a study of the market.

The bureau knew it faced some problems. First of all, while both utilities and contractors consider the commercial field as a single market, it is not susceptible to a common approach as is the residential market.

To conduct a full-scale promotion in all commercial fields would be impossible, the bureau reasoned. Thus it decided to let selection of which to promote be guided by these factors: 1. Extent of potential business for the industry; 2. Present degree of wiring adequacy; 3. Assistance needed in selling; 4. Ease of selling.

With this in mind, the bureau questioned utilities and contractors. The findings:

- Typical retail establishments (supermarkets, small retail stores, etc) are believed to offer the greatest potential increase in kwhr sales and the easiest on which to make improvements. They were the overwhelming choice for first promotional attention.
- Apartment houses are most handicapped by poor wiring. But they also require the most service calls and the most promotion to sell.
- Office buildings are the easiest to sell, and offer the best opportunity to expand wiring sales.
- Direct mail is the best form of sales promotion the bureau can undertake, both on a national and local basis.
- Initial promotion should emphasize wiring in existing structures rather than in new structures.

Another **TRIANGLE** *multiple product Job*

HOUSTON

Everything's BIG in Texas—
and now Houston has added another BIG

$17,000,000 Building of Bank of the Southwest Opens Its Doors

2,103,500′ of TRIANGLE WIRE AND CABLE
322,580′ of TRIANGLE CONDUIT

Bank of the Southwest. Its lobby, 63,000 square feet, is the largest in America. This ultra-modern building covers an acre and a half and rises 24 stories. The entire building is air conditioned by the largest electronically controlled system in the country.

ARCHITECT: Kenneth Franzheim
ENGINEER: H. E. Bovay (mechanical and electrical)
GENERAL CONTRACTOR: W. S. Bellows
ELECTRICAL CONTRACTOR: Fisk Electric Co.

That's how much top-quality Triangle footage went into the building. A sizeable order, by any standards, and delivered on time.

Triangle Distributors are able to meet deadlines on big orders like this because *Triangle's 100% distributor policy* means production is geared to distributors' needs, assuring them of ample stocks to meet heavy delivery schedules and emergencies.

And every foot of Triangle material is top-quality because Triangle's manufacturing plants are equipped with the most modern production machinery and laboratory facilities available . . . operated by men who know their jobs.

That's why those who know, specify **TRIANGLE**
IT MUST BE RIGHT

Let's take a Quick Look at TRIANGLE

TRIANGLE
Up to date research
Large stocks in redistribution centers
Ever expanding plants
The Triangle Trademark is your guarantee of quality

"It Must Be Right" The Trade Mark of TOP Quality
TRIANGLE®

TRIANGLE
Conduit and Cable Co., Inc.

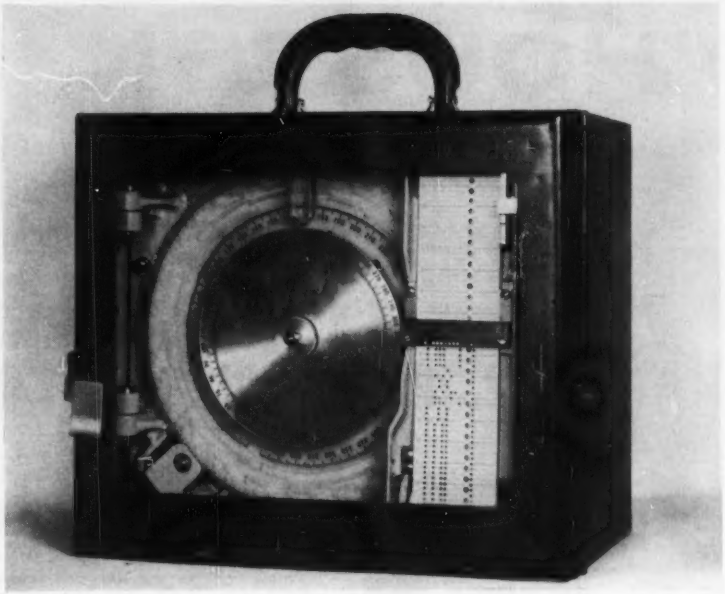
NEW BRUNSWICK, NEW JERSEY

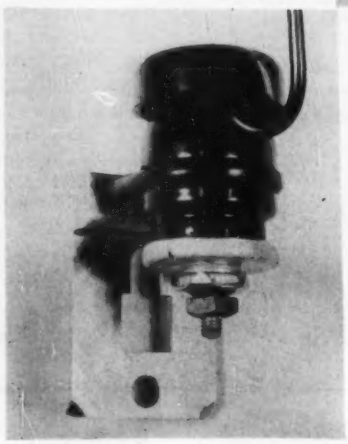
NEW EQUIPMENT

Demand Recorder

Utility people will be interested in this Digital Demand Recorder which automatically produces a punched tape record of watt-hour demands. The record may be read visually or with the manufacturer's Automatic Tape Translator. The recorder and translator in load research work will allow utility management to get up-to-date information on load characteristics rapidly and inexpensively, according to the manufacturer, who claims also that recorder use in customer demand billing will allow automatic billing procedures.

Fischer & Porter Co, Hatboro, Pa.





Pellet-type Lightning Arrester

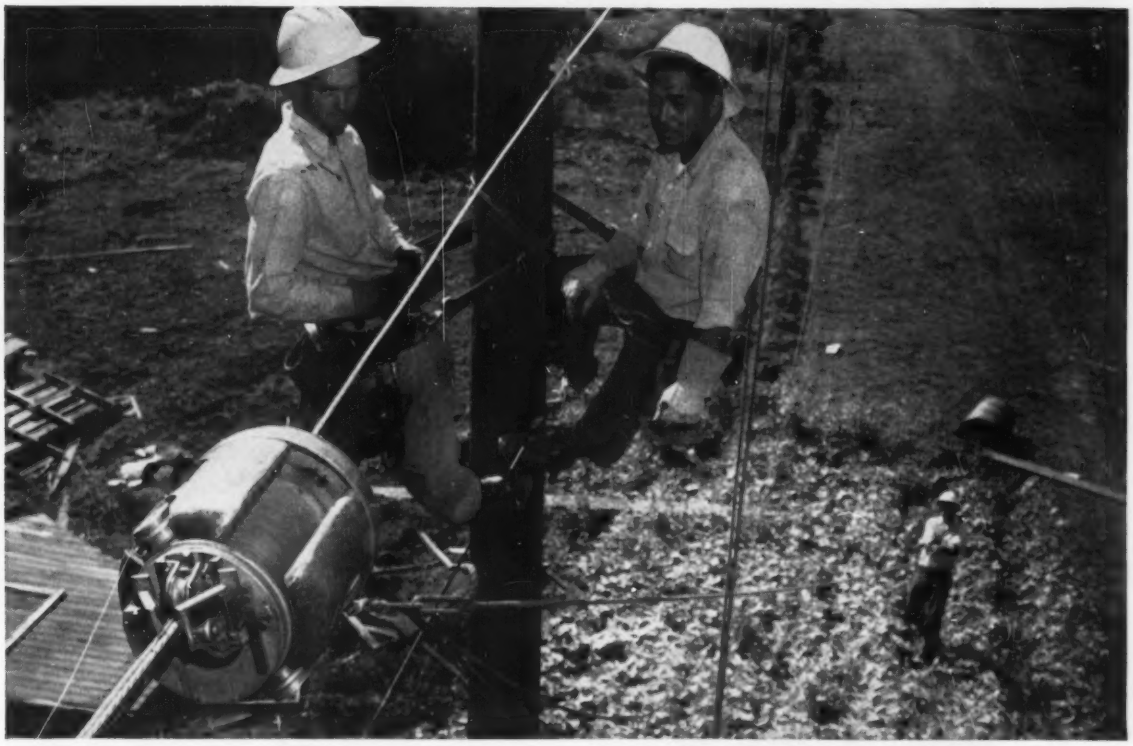
This pellet-type lightning arrester has a one-bolt mounting bracket, a clamp-type ground terminal (needs no connector, spacing, etc.), and a flexible line lead for easy mounting. A lineman can install it with one hand, according to the manufacturer. He merely slips it over the head of the crossarm bolt or lag screw, lowers it into the bracket slot, and tightens the lag screw.

General Electric Co, Schenectady 5, N. Y.

'Tele-King' Aerial Lift

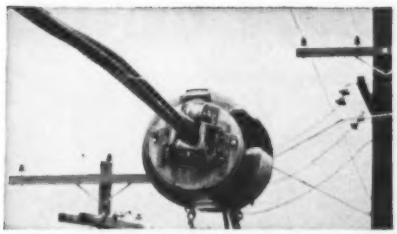
Here's another utility item of interest. This truck-mounted lift is said to permit easy maneuverability; its booms rotate 400 degrees, 40 degrees past full circle. Boom and crow's nest coatings have a tested dielectric strength of 20,000 volts. Winch is a hydraulic reel loader operated from crow's nest. A 2-way intercom and proximity alarm are optional.

Skyworker Corp, Milford, Conn.



Linemen prepare to pass cable spinner by pole and fasten messenger as assistant on ground pulls spinner along the line. Neoprene withstands sunlight, temperature extremes and industrial fumes overhead . . . resists grease, ozone cracking and electrolytic attack *anywhere*. Neoprene jacketing gives cable maximum protection . . . reduces maintenance and replacement costs.

Cable spinning secures durable neoprene-jacketed secondaries for Portland General Electric Co.



Completed cable at upper left has been lashed to form a single unit, neater in appearance than former open-wire cross-arm construction. Portland General Electric estimates a 40 per cent reduction in accessories, and spun secondary permits long-span construction, which saves poles.

Over 150 miles of neoprene-jacketed cable installed since 1951

Portland General Electric Co. is making sure that maintenance costs will stay low on new overhead secondaries in expanding industrial and rural Oregon. Cable spinning is expected to bring sizable savings in future maintenance costs, compared with open-wire systems, and it cuts accessory costs as much as 40 per cent. Du Pont neoprene gives the ultimate in long-term cable protection... and its resistance to cutting and cold flow are especially important in an installation like this.

Since 1951 Portland General Electric has used over 150 miles of neoprene-jacketed cable. They report, "We've had five years of satisfactory service from neoprene-jacketed cable and expect many more."

This is another example of the confidence utilities place in neoprene—the synthetic rubber that resists sunlight, weathering, abrasion, industrial fumes, and virtually *all* other sources of jacketing failure. Ask your supplier about long-lasting wire and cable jacketed with neoprene. It's available in voltage ratings to meet your requirements.

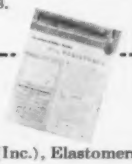
NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*



FREE! THE NEOPRENE NOTEBOOK. Every issue contains interesting stories about products made with neoprene. Actual case histories give you the facts about neoprene's longer service life. Clip coupon to get on the mailing list. E. I. du Pont de Nemours & Co. (Inc.), Elastomers Division EW-10A, Wilmington 98, Delaware.

*Name*_____ *Position*_____

*Firm*_____

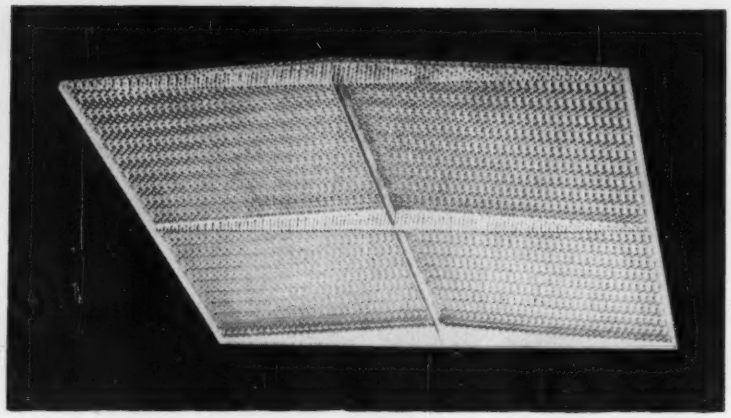
*Address*_____

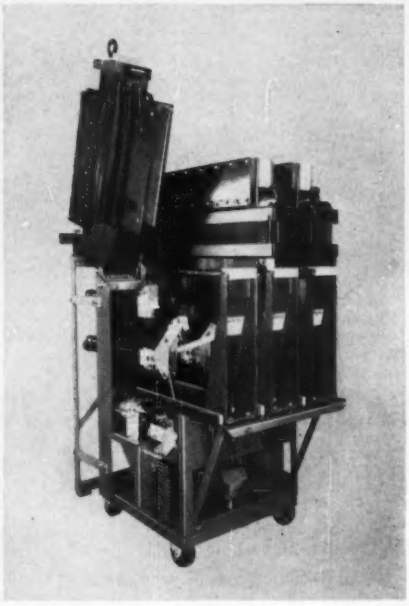
*City*_____ *State*_____

Light Control Lens

A touch of the modern in lighting for public areas is afforded in this illumination control lens for fluorescent lights. Called a "Prismalume Controlens," its conical plastic prismatic elements are said to produce high footcandle dispersion that is free from glare. Can be used for troffer installations, luminous panels or complete ceilings.

Holophane Co, Inc, 342 Madison Ave, New York 17, N. Y.





Power Circuit Breakers

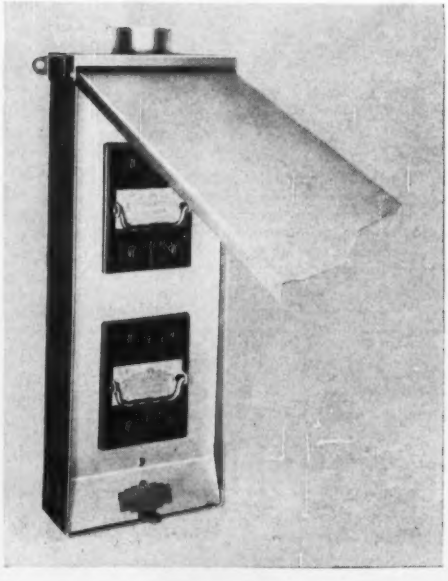
Power circuit breakers have been developed in anticipation of three new higher industry-standard ratings for metal-clad switchgear. Model illustrated, designated 15HV-750, is for 13.8kv, 1,200 and 2,000 amp applications. It has an interrupting rating of 750 mva. Model 5HV-350 is for 4.16 kv, has an interrupting rating of 350 mva with continuous current rating to 3,000 amp for bus ties and 1,200 amp for feeders. Also for 4.16 kv applications, Model 5HV-75 is rated at 75 mva, for 1,200 amp use.

I-T-E Circuit Breaker Co, Philadelphia 30, Pa.

Pull-out Switch

A pull-out switch has been designed especially for rural areas. Rain-tight in construction, the unit has a 200-amp main lug with two 100-amp pullout branches. The 100-amp lugs may be used on such typical farm applications as mains for the barn or milk cooling apparatus. Called a "Pull Fuse Switch," it has provisions for pole mounting and padlocking. Also available with one and two 30-amp, 2-pole switches.

Frank Adams Electric Co, St. Louis, Mo.



(*More New Equipment on page* 130)

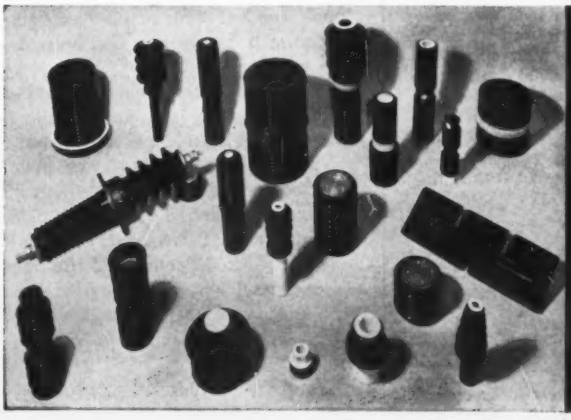
VICTOR PROGRESS REPORT #5

VICTOR
PURIFIED PORCELAIN

the Industry's standard for Special Shapes!

The hydraulic testing machine shown above is located in Victor's special porcelain testing department. Insulators such as these open cutouts are given a calculated transverse load before electrical test. The inspector on the left is checking hole alignment.

Starting with *Purified* Porcelain—finest insulator porcelain ever made—all special shapes made by VICTOR undergo rigid quality controls, tests and inspections to assure users of the best insulating materials money can buy. If you need special shapes required in cutouts, circuit breakers, potheads, capacitors, switchgear, transformers and other electrical equipment, choose the best! Choose VICTOR!



SPECIFY VICTOR
Purified Porcelain Insulators!

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

SHAWMUT
Amp-trap*

. . . THE SUPER-CURRENT SLAYER

When you want to kill giant Short-Circuits almost before they start — some form of Amp-trap can do it. Amp-trap will limit peak available short-circuit currents on low voltage circuits and prevent them from developing full magnetic or thermal destructive force. Ask about Amp-trap and its many capacities and arrangements. Find out about this amazing current limiter now. It is an entirely new form of protective device with current limiting action on short-circuit currents up to 100,000 Amperes R.M.S. or 200,000 Amperes (peak), at 600 Volts. Because Amp-trap *anticipates* destruction it protects your investment by eliminating the need for replacement. Write for Bulletin 514. There is no obligation.

*Trade Mark Registered.

REGISTERED UNITED STATES PATENT OFFICE
Est. 1893

AMP-TRAPS — "Awake At The Switch"
THE CHASE-SHAWMUT CO.
374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

Amp-trap Trion t-d C-O-T Trionet O-T FUSE WIRE

Secondary Capacitor

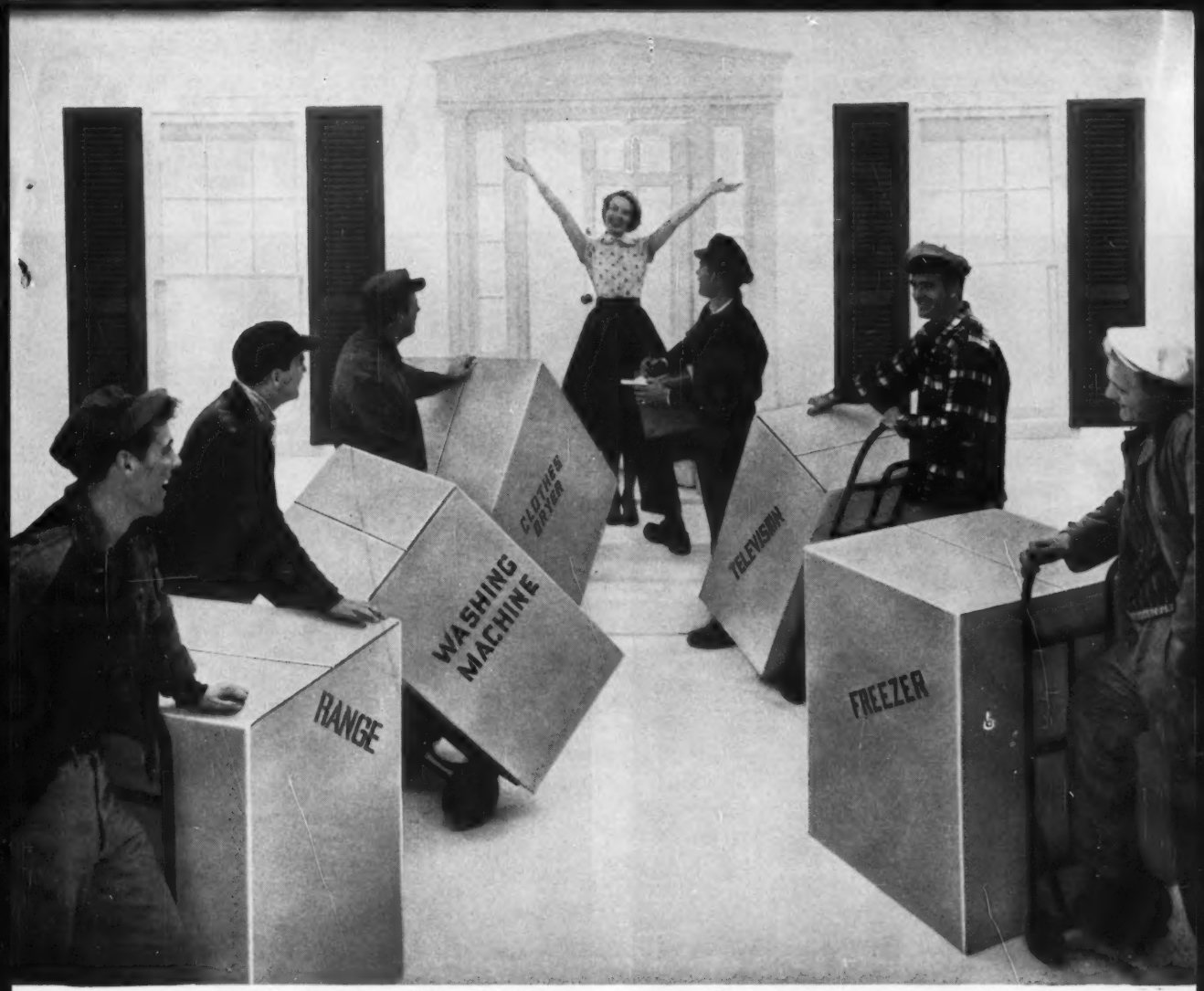
A 10-kvar, single-phase, 240-volt capacitor, designed for power factor correction on secondary distribution circuits, is said to meet all NEMA standards. With an over-all height of 29⅞ in., the unit features solder-sealed bushings, two 48-in. insulated leads and steel tanks protected from corrosion by the manufacturer's aluminum metalized finish and an alkyd-resin paint. Terminal mounted fuses, integral to the leads, are available when required. Unit may be mounted with bushings up or down. A 2-hole bracket is furnished for direct pole mounting, or an EEI-NEMA bracket is provided for crossarm mounting.
Line Material Co, 700 W. Michigan Street, Milwaukee 1, Wis.

Cable Splice Insulation Kit

A cable splice insulating kit for use on rubber, neoprene, lead and aluminum sheathed cable or oil-filled cable carrying 5 kv or less has been developed.

A clear plastic mold is snapped around the cable joint, and the manufacturer's "Thiokol Epoxy" compound is poured into the top of the mold. The compound solidifies in 10 to 20 minutes, forming a reportedly tight, strong, resistive insulated joint. Kit includes: Mold, compound for one joint, spatula, pressure-sensitive tape, mold adhesive and instructions.
Acme Wire Co, New Haven, Conn.

(*More New Equipment on page* 134)



SCORES OF APPLIANCES available to today's homeowner make even 100-Amp service entrance questionable.

HOW LONG BEFORE YOU SAY, "100-Amp service is obsolete"?

It may be sooner than you think!

More capacity is needed almost day by day. First it was 60-Amps. Now 100-Amps. And people in some areas are already talking about 150-, even 200-Amps. The flood of new appliances — clothes dryers, ranges, freezers today, central air conditioning and the heat pump tomorrow — is fast changing our ideas of what is adequate service.

It's good business to install service cable with the capacity homeowners will need in the future: ANACONDA Silvaline* Type SE Service Entrance Cable.

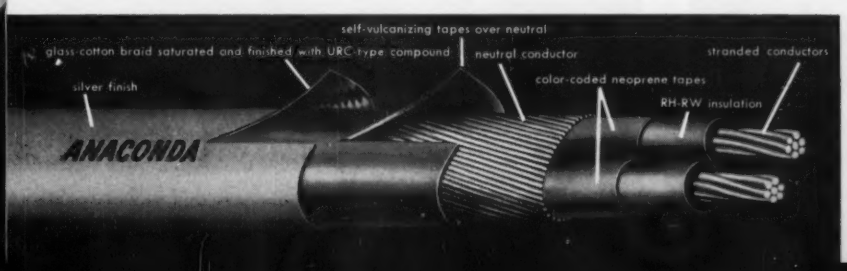
Long life under severe conditions. Silvaline is the only service entrance cable with URC† saturant and finish. Resists festooning . . . assures long life.

Fewer complaints. Silver finish on Silvaline takes any type or color of house paint . . . won't bleed through, flake or peel. Ends customer complaints.

Available in copper or aluminum. Ask the Man from Anaconda or your local Anaconda distributor for more information, and write for folder on Silvaline Type SE Service Cables. Address: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 56352E

*Reg. U. S. Pat. Off. †Utilities Research Commission

ASK THE MAN FROM ANACONDA® FOR SILVALINE SERVICE ENTRANCE CABLE



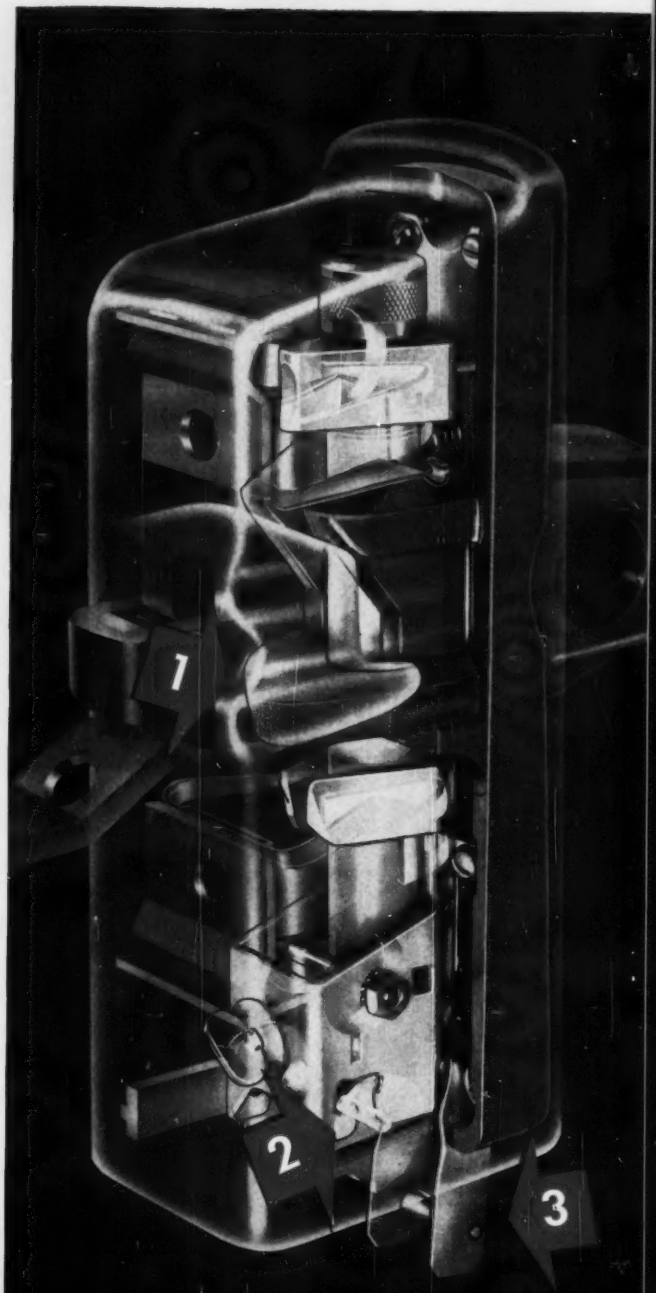
SILVALINE TYPE SE CABLES—
100-AMP RATING OR MORE

Conductors	Insulation	Rating (in amps)
3/C #3 with #3 or #5 neutral	RH-RW 75°C	100
3/C #2 with #2 or #4 neutral	RH-RW 75°C	115
3/C #1 with #1 or #2 neutral	RH-RW 75°C	130
3/C #0 with #0 or #1 neutral	RH-RW 75°C	150

old

1. Old-type barrier overlaps housing barrier retarding flow of expulsion gases—
2. Single-hinge hook made removal and replacement of door difficult.

new



1. Snug-fitting neoprene rubber barrier prevents expulsion gases from bridging cutout contacts.
2. Double-hinging of cutout door provides for accurate door closing.
3. Semaphore gives reliable indication of blown fuse—easily seen from the ground.

ALL-NEW ENCLOSED FUSE CUTOUTS

now...

Snug-fitting neoprene barrier prevents internal flashovers

Double-hinging assures accurate door closing

Flip-out semaphore indicates blown fuse

SNUG-FITTING NEOPRENE BARRIER stops potentially dangerous expulsion gas flashovers from occurring between contacts in General Electric's all-new enclosed fuse cutout. This neoprene rubber barrier fits snugly around the fuseholder and, in conjunction with contoured porcelain of the housing, provides an effective seal.

DOUBLE-HINGING OF CUTOUT DOOR to porcelain housing provides for accurate door closing. Provides more stable support for removal and replacement of cutout door in service. Non-ferrous housing hinge pins give longer life even under severe service condition.

FLIP-OUT SEMAPHORE gives clear indication of blown fuse. This spring-actuated device at the bottom of the fuseholder aids instantaneous flip-out of the fuse link cable after the fuse blows. This is particularly important during low-current interruptions. As a semaphore, it gives reliable indication of a blown fuse because it can be easily seen from the ground—a real advantage on non-dropout units.

ALL FROM ONE SOURCE—General Electric's new Enclosed Fuse cutout line gives you a choice for every need—indicating-dropout, indicating-non-dropout, disconnect—in one basic design. You can select from two current ratings, 50 and 100 amperes, and two voltage ratings, 5.2 and 7.8 kv, to match every system demand.

OTHER FEATURES your lineman will like: safety-grip door handle (puts an end to switchstick juggling)—unique plastic-to-metal latching (prevents door "seizing")—extra easy fusing and line connecting for fastest possible installation and servicing.

For a complete description of the new cutout line, write for Bulletin GEA-6208, General Electric Company, Section 433-16, Schenectady 5, New York.

Accurate—Highly Dependable General Electric Fuse Links

Assure maximum effectiveness of your General Electric Fuse Cutouts with General Electric Fuse Links that feature:

Low-melting point alloy of lead and silver in fusible element . . . Specially stranded cable for maximum flexibility . . . Lowest resistivity . . . Auxiliary Fuse tubes that will not warp or shrink . . . Proper balance of strain wire and fusible wire . . . Button cap seal and solid washer to confine gases . . . Assure positive operation . . . simple replacement.

Order them from your General Electric Distributor today.

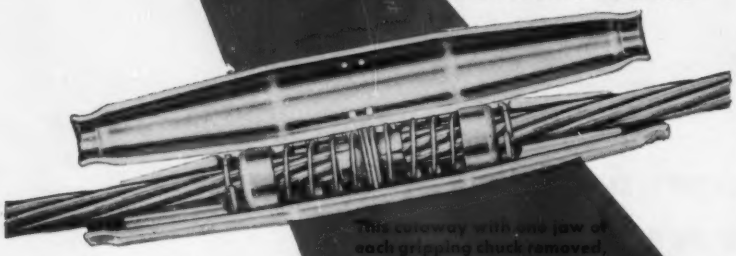
Progress Is Our Most Important Product

GENERAL ELECTRIC

for ALL-ALUMINUM Conductors use...

Reliable **TENSION SPLICES**

FOR PERMANENT ELECTRICAL CONNECTIONS



This cutaway with one jaw of each gripping chuck removed, shows how pilot cups guide conductor through jaws to center stop.

The feed-thru design of the Reliable "55" Series Tension Splice assures both a permanent mechanical splice and an efficient electrical connection. The pilot cups cap and guide the soft aluminum strands through the jaws to the center stop. Jaws cannot engage conductor at all until and unless the pilot cup, capping strand ends, has passed clear through the gripping area. Strand then within gripping area is free of burrs and in lay.

FOR SOLID CONDUCTOR

Pilot cups are not necessary with solid conductor, therefore these Reliable tension splices have release slots that permit re-use if desired. The gripping chucks assure permanent splices.

All Reliable Tension Splices for aluminum are equally efficient when used with aluminum alloy conductors . . . parts are chemically cleaned to give high surface conductivity, then greased and individually packaged at the factory. No tools are required for fast, efficient installation. Momentary tension is all that is needed to insure a permanent electrical and mechanical connection.

Reliable **ELECTRIC COMPANY** 3145 Carroll Avenue Chicago 12, Illinois

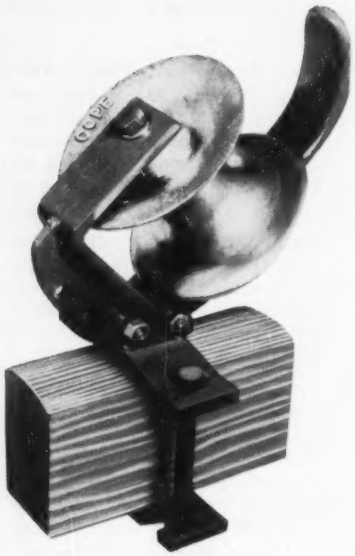
Over 45 years of service to the Utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

Volt-Ammeter

Two standard ranges have been added to GE's Type CF-7 portable hook-on recording volt-ammeter to increase the instrument's flexibility. New current ranges of 30 and 300 amp, bring the total number of ranges to four. The others are 15, 75, 150 and 750 amp. Three voltages ranges, 150, 300 and 750 ac are also available. The CF-7 is said to combine the features of a Butyl-molded, hook-on current transformer insulated for an ASA rating of 8700 v with the simplicity of the CF inkless recorder. Suitable for indoor and outdoor applications, it is claimed to be useful for checking loads on distribution lines, verifying motor loads and in detecting and recording overloads on circuits, transformers and other ac apparatus.

General Electric Co
Schenectady 5, N. Y.



Angle Cross Arm Sheave

An angle cross arm sheave has been designed for pulling cable around corners. The sheave, available in either aluminum or malleable iron, is mounted on a steel yoke, and is said to facilitate the installation of aerial cable. Adjustable to any angle to 90 degrees, it comes in two sizes: one for cables up to 3 in. diameter, the second for cables up to 4 in. diameter.

T. J. Cope, Inc, Collegeville, Pa.

Fuse Holders

A line of fuse holders has been designed that indicates a blown fuse with a flashing light. Made of Plaskon alkyd molding compounds, the holders can be mounted on any dead front panel or switchboard for easy removal and replacement of fuses. They consist of a mounting base which attaches to the rear of the panel, together with one or more fuse carriers with built-in indicator lamps.
Fuse Indicator Corp
99 Chauncy Street, Boston, Mass.

Auditorium-Size TV

An auditorium-size compatible color television projection system, which produces pictures up to 4½ by 6 ft for audiences of approximately 500 persons for closed-circuit applications in schools, hospitals, business and industry is scheduled to go into commercial production this autumn. At the same time an auditorium-size monochrome projection system, known as TLS-51, identical with the color TV system except it utilizes black and white instead of color tubes, will also be produced. It is capable of producing pictures up to 6 by 8 ft.
Radio Corp of America
Camden, N. J.

(*More New Equipment on page* 136)

with ALL-ALUMINUM Conductors

Reliable **FEED-THRU DEADENDS**

PROVIDE UNFAILING SERVICE

Reliable experience in building deadends for copper has solved the problem of deadending aluminum conductor. The Reliable designed feed-thru gripping chuck that has proved itself in millions of unfailing applications is used in this line of Deadends.

Clamping pressure is smoothly distributed and does not deform the conductor—Deadending unit is light enough to avoid concentrating vibration stresses. Exhaustive tests have been made to insure efficiency. As in Reliable Tension Splices, no tools are required for fast, economical installation.

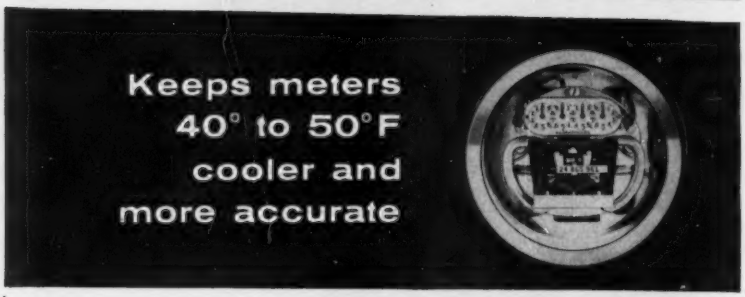
INSULATED SPLICING ASSEMBLY

This Reliable assembly offers economy of time and material as well as permanent performance. Insulated splicing assemblies are ideal for series lighting circuits and for sectionalizing circuits without double arm deadending.

Reliable **ELECTRIC COMPANY** 3145 Carroll Avenue Chicago 12, Illinois

Over 45 years of service to the Utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES



Alcoa® Aluminum meter shields are designed to protect damping magnets against surges caused by lightning. Surges cause meters built before 1946 to run much faster . . . lead to embarrassing conflicts with customers.

They also keep meters up to 50° F cooler by reflecting heat from the sun. This is especially important with delicate demand meters.

Typically, power company experience shows it costs about $1.50 every three years to inspect meters. Repairs average $5.00. Alcoa meter shields can extend this repair cycle, protect the meter for longer periods and assure maintaining its accuracy.

For complete details and prices (generally running about 50¢ per shield), contact your nearby Alcoa sales office. Aluminum Company of America, 2308-J Alcoa Bldg., Pittsburgh 19, Pa.

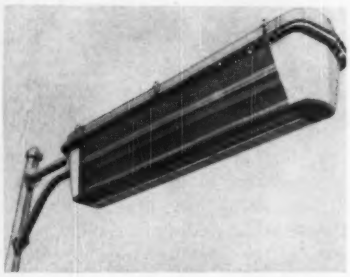
THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Tension & Velocity Control

Control of tension and velocity in mechanical processes, such as winding and feeding of paper, textiles, metal strips, etc., reportedly can be obtained automatically with "Dancetrol." Tension ranges from a few ounces to several hundred pounds and constant velocities to hundreds of feet per minute are attainable. Two types of Dancetrol units are available. The "Limit Switch" type provides on-off control for variable speed drives. The "Proportional" type provides control for variable speed drives with the "speed-up" or "slow-down" signal proportional to pivot arm movement.
Jordan Co, 3235 W. Hampton Ave Milwaukee 9, Wis.



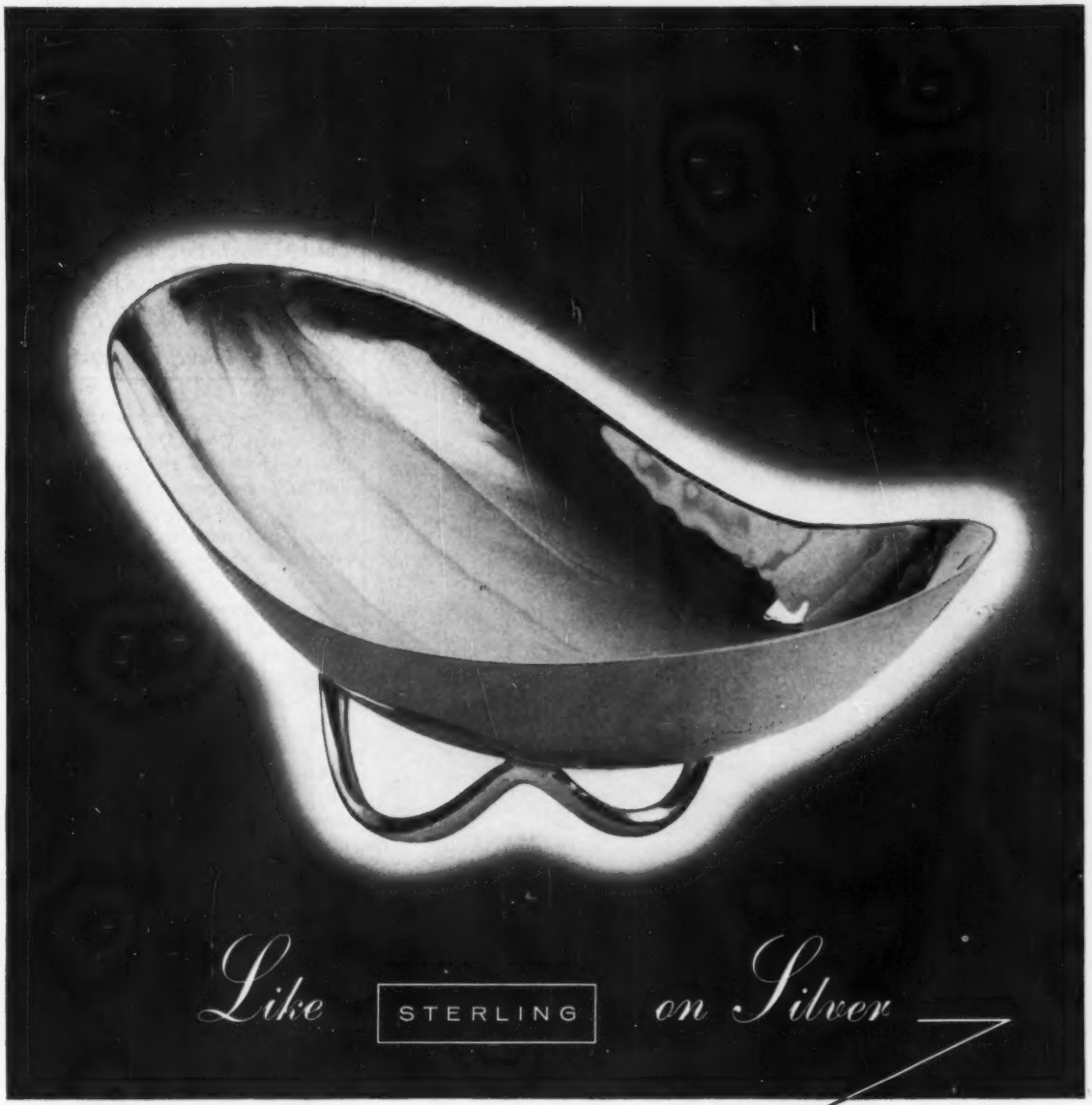
Fluorescent Luminaires

A line of fluorescent luminaires is said to be the first designed to accommodate present standard or future VHO (very high output) lamps of 4 or 6-ft lengths. Available with either deep or shallow Plexiglas globes, they reportedly retain the high optical efficiency of original units. They incorporate features that are claimed to facilitate installation, such as a globe latched on each side, hinged to allow easy relamping; a hinged lamp assembly and reflector to allow access to the internally housed ballasts and wiring; tin-plated terminals to accommodate either copper or aluminum conductors; and friction type connectors.
Line Material Co, Milwaukee 1, Wis.

Dehumidifying Heater

"Dampp-Chaser" is a specially designed dehumidifying heater for the protection of electrical and electronic equipment. It operates to keep the

(*More New Equipment on page* 138)



STERLING SILVER BY BLACK, STARR & GORHAM

AUDITED PAID CIRCULATION ABC

ON **Electrical World**

25,397 PAID CIRCULATION, 6/30/56

USCO Center-Break SWITCHES

Offer economy, simple installation and ease of operation!

Available:
15-115KV, 400-1200 Amperes
Shown is 69KV, 600 Ampere

The USCO type GCH-3 Switch offers numerous economies. With this switch you can save insulator stacks—three pole switch, save three stacks—and you save on steel by reducing the overhead clearance requirements.

Installation is simple and quick. And it operates easily, smoothly in all mounting positions.

The design of this switch eliminates the necessity of braided shunts by using high-pressure contacts. Copper bus bars ride on the milled rings on the contact posts. The transfer contacts are made of bus bar copper and pure coin silver. Here is a switch with high-pressure, line-swing contacts as well as the high-pressure feature found in the main contact. All component parts of this and other USCO switches are designed and manufactured in the USCO factory.

For full details, write directly to:

USCO Power Equipment Corp.

829 North 36th Way, Birmingham 4, Alabama • Phone LYric 2-7241

Designers and Manufacturers of High Voltage Electrical Equipment for Utilities, Cooperatives and Industry

Dehumidifying Heater

(*Continued from page* 136)

temperature of the space it is protecting 2 or 3 degrees above that of external environment. This is said to eliminate condensation due to temperature changes. Maker claims it distributes heat evenly, affords no personal or fire hazard, and is tamperproof. Heater is tubular, ¾ in. dia, 36 in. long and rated at 25 w. Reportedly easily installed.
Dampp-Chaser, Inc,
Hendersonville, N. C.

More New Products

Chevrolet Motor Division of General Motors Corp, Detroit 2, Mich., offer 88 models of 1957 **trucks** on 22 different wheelbases. Three new V8 engines are available, with reported better performance, economy, increased durability and safety.

Westinghouse Electric Corp, Bloomfield, N. J., have a 1,200-watt **projection lamp** that fits projectors designed for 1,000-watt lamps, and is said to provide up to 30% more screen lumens.

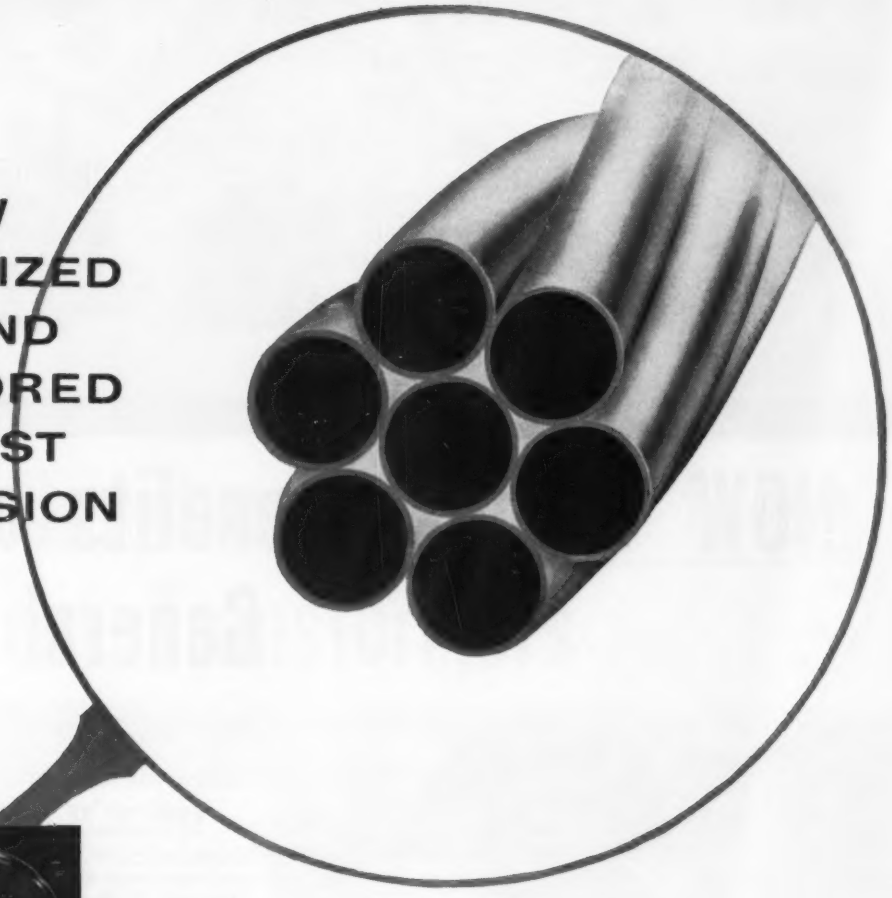
Metals & Controls Corp, General Plate Division, Attleboro, Mass., has developed a **metal clad combination** of medium carbon hardenable **steel** (SAE-1065) and high conductivity **copper** (OFHC). The metals are said to be inseparably bonded, producing a metal reported to have high conductivity, excellent spring characteristics by heat treatment, resistance to corrosion, ductility, good operating characteristics at elevated temperatures and low cost compared to hardenable copper alloys.

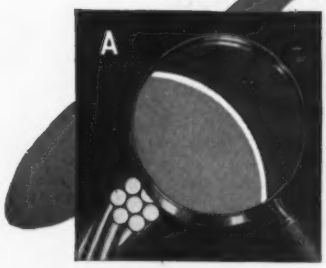
General Electric Co, Schenectady 5, N. Y., offers a complete line of **shallow height ballasts** for 430 ma T12 lighting systems. They are 1-25/32 in. high and allow a 1 to 4 lb weight reduction.

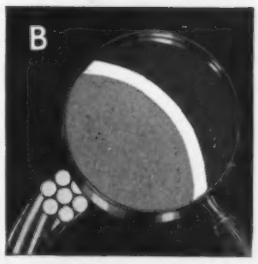
Anaconda Wire & Cable Co, 25 Broadway, New York, N. Y., has a **film-insulated solderable magnet wire.** Called "Analac," it is said to provide a saving in labor by elimination of the process of removing insulating

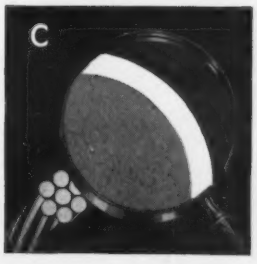
(*More New Products on page* 142)

HOW BETHANIZED STRAND IS ARMORED AGAINST CORROSION









The job of armor is to protect. In the case of steel strand, the armor is the protective zinc coating that encases every wire. But some zinc coatings are better than others, and therefore cost less in the long run. A great many buyers, with an eye on the budget, have now standardized on Bethlehem strand with the bethanized zinc coating.

Bethanizing is a very successful process developed by Bethlehem—a process that bonds the zinc to the strand by an electrolytic method. The coating thus produced is so uniform and ductile that it will resist cracking or peeling under severe deformation. This is the best possible protection against moisture and other corrosive influences.

Furthermore, the bethanized coating offers another great advantage to users. It is available in three different weights—A, B, and C. Coating A is equivalent to extra-galvanized. B is twice the thickness of A. The heaviest, C, is three times the thickness of A. In price, there isn't a great deal of difference. Thus the user can select a coating that exactly meets his needs, and can, at the same time, keep his costs from going sky-high.

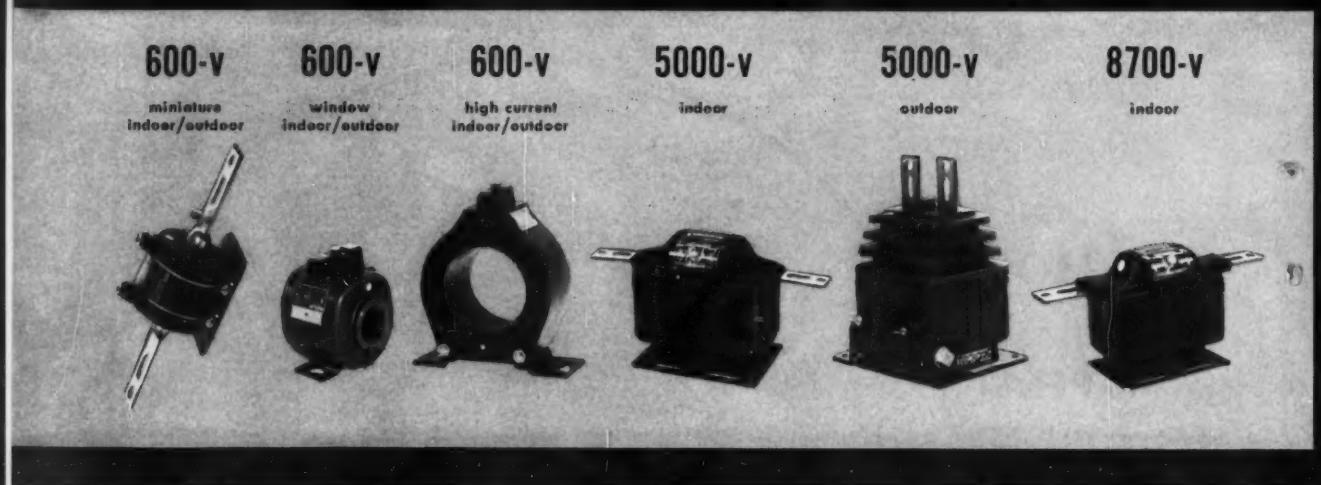
There's much more to be told about bethanized strand. Space prevents our telling it here. But if you'll call our nearest office, a Bethlehem man will be glad to give you the full story. It makes good listening.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

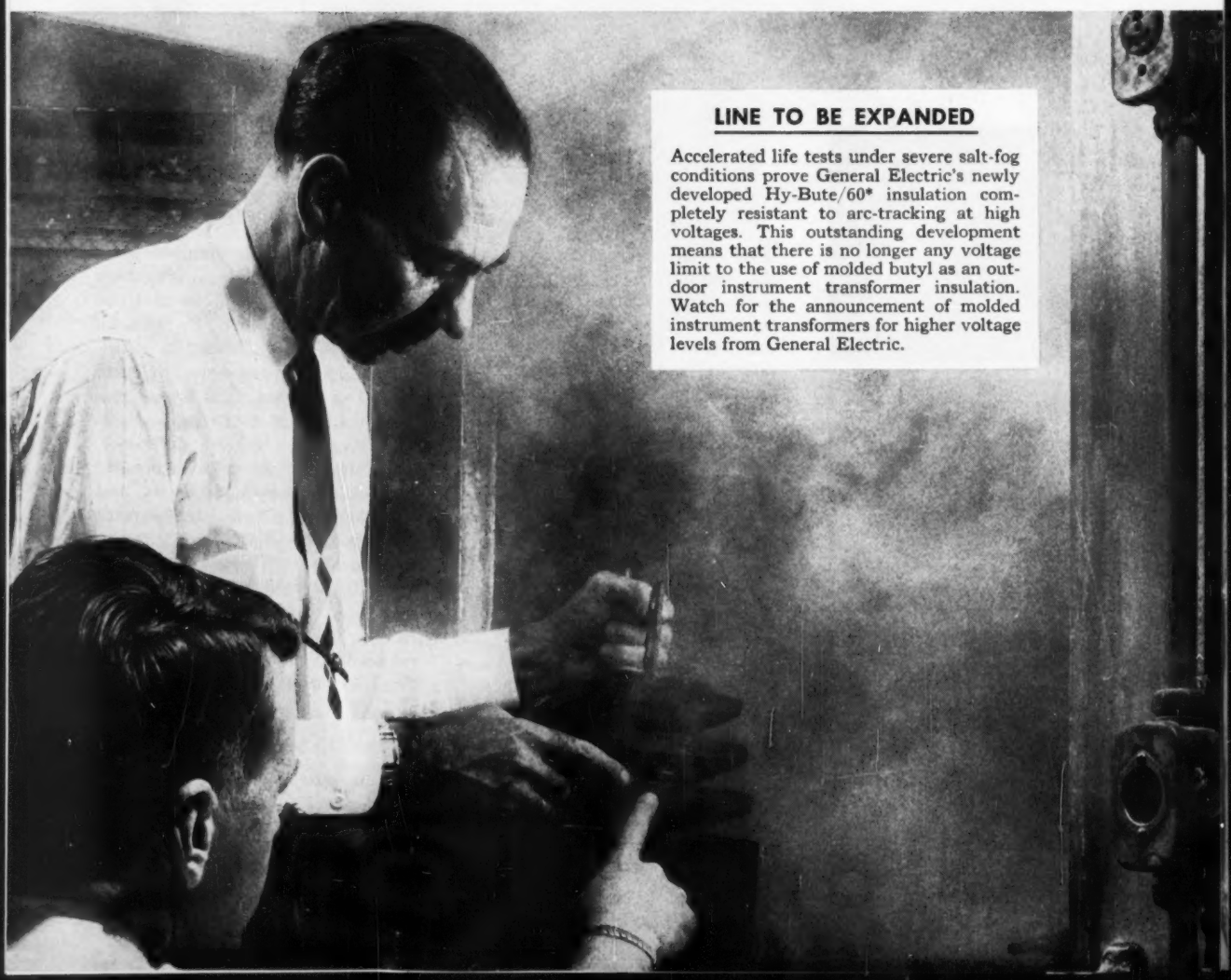
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



NOW You Get Benefits of Butyl-General Electric



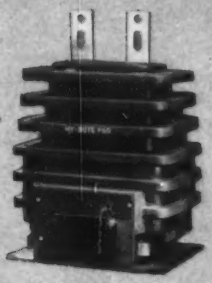
LINE TO BE EXPANDED

Accelerated life tests under severe salt-fog conditions prove General Electric's newly developed Hy-Bute/60* insulation completely resistant to arc-tracking at high voltages. This outstanding development means that there is no longer any voltage limit to the use of molded butyl as an outdoor instrument transformer insulation. Watch for the announcement of molded instrument transformers for higher voltage levels from General Electric.

8700-v
outdoor

15000-v
indoor

15000-v
outdoor



COMPARISON CHART

G-E	X	X	X	X	X	X	X	X	X
MFR-A	X			X					
MFR-B		X	X						

Now General Electric offers molded instrument transformers in a complete line from 600 volts through 15,000 volts.

Molded Construction in all these Instrument Transformers

New 8700-volt indoor and new 8700-volt outdoor current transformers make line complete from 600-v through 15-kv

Molded in Butyl or new Hy-Bute/60* insulation, these nine General Electric instrument transformers give you many cost-saving benefits.

Maintenance is sharply reduced because butyl is corrosion resistant. There are no metal tanks to rust out—no painting is ever required no matter how corrosive the atmosphere. Porcelain bushings, which can break during installation or operation, have been completely eliminated and continuous thermal ratings of 150% to 200% on many models minimize the need for replacing transformers with higher ratings as loads increase.

Stock needs are reduced because many of the new butyl designs replace several older types. The 600-volt butyl types provide greater application flexibility because they can be used either indoors or outdoors. You save money too, since each new butyl-molded design is priced the same as the least expensive of the older models it replaces.

Easier Installation results from the smaller size and lighter weight of butyl-molded transformers. In addition, they can be mounted in any position.

Safer and more reliable operation is assured because flame-resistant butyl will not support fire. Design features such as increased creepage distance add to the dependability of this complete family of molded instrument transformers.

Only General Electric brings you all the advantages of butyl-molded construction in a complete line of indoor and outdoor current transformers from 600-v through 15-kv. For details, call your General Electric Apparatus Sales Representative or request bulletin number GED-3112 from Section 581-3, General Electric Company, Schenectady 5, New York.

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LINE
SUPERINTENDENT:

WHAT DO
YOU KNOW
ABOUT
RT&E?

As one of the important men who keep power flowing to the nation's homes and industries, you should know something about one of America's leading suppliers of power equipment.

While we are not the largest transformer builder, we are one of the most dependable. We keep your concern for your men and equipment in mind at all times. A little more care on our part will save time for your men and money for your company.

We have several exclusive features that were either suggested by you, or designed to make life of your men easier and faster. Our externally operated tap changer is standard equipment; our dual voltage transformer is operated from outside the tank. Maintenance and service calls are minimized by our radio noise-proof construction, high overload capacity and lightning surge strength. Our units are guaranteed for five full years.

Next time your men go out to install an RT&E Transformer, you can be sure their job will be speedy, simple, and safe.

RT&E CORPORATION
WAUKESHA, WISCONSIN

Equipment to help provide power for America

More New Products

(*Continued from page* 138)

film to make joints either during the winding process, or when attached to lead wires or another conductor. Dielectric loss, dielectric strength and dielectric constant all make it suitable for use in windings that generally are used on electronic devices.

Times Wire & Cable Co, Wallingford, Conn., announces the availability of **silver plated copper or copperweld wire** of from 16 through 20 gauge, with a degree of uniformity of plating reportedly within 1%.

Minnesota Mining & Mfg Co, Irvington, N. J., have modified their Hyflex and Transflex **vinyl electrical tubing** to impart fungus resistance without sacrificing flame resistance or clarity.

CATALOGS—BULLETINS

• **LIGHTING:** A line of industrial fluorescent lighting units is described in Bulletin "b" issued by Benjamin Electric Mfg Co, Des Plains, Ill.

• **SPECIFICATIONS:** The following specifications were published recently by Minneapolis-Honeywell Regulator Co, Industrial Division, Philadelphia 44, Pa:

Thermocouple extension wire with polyvinyl insulation, gauge sizes 14, 16 and 20 are covered in Specification S002-1.

Float-actuated flow meter is described in Specification S222-1.

Vane-actuated switch is illustrated and described in Specification S800-1.

• **TRANSFORMERS:** "Power Transformer Instruction Handbook," 427-R-1 and "Instructions for Installation and Operation of Moloney Distribution Transformer," Booklet 375-1, are available from Moloney Electric Co, St. Louis 20, Mo.

• **INTERRUPTER SWITCH:** Bulletin 100 gives illustrations and details on the new High Voltage Air Interrupter Switch manufactured by Continental Electric Equipment Co, 205 W. 4th Street, Cincinnati 2, Ohio.

• **PIPE PUSHING:** A manual, called "Power Pipe Pushing" describing the techniques of power pipe pushing is considered to be of interest to anyone concerned with underground pipe or conduit installations. No charge, write Mercury Hydraulics, 2440 Blake Street, Denver 5, Colo.

• **HOT SPRAY:** "Why Hot Spray" has been revised and enlarged; it lists the benefits of hot spraying finishing materials in detail, and has a new Question & Answer section. Write Spee-Flo Co, 720 Polk, Houston 2, Texas.

(*More Catalogs on page* 144)

MORE CAPACITY

Chase® Bus Conductors carry 20% more load!

Those ventilating holes in Chase Ventilated Square Tube Copper Bus Conductor help dissipate heat... and increase current-carrying capacity up to *20%*. And ventilated square tube bus conductor can *also* save you as much as *36%* in weight of copper as compared to flat rectangular bus bars!

Because of its rugged, square cross section configuration, Chase Bus Conductor is much stronger. It withstands the tremendous stress of heavy short circuits, permits longer spans between supports.

For more information, send for the free Chase Bus Conductor brochure.

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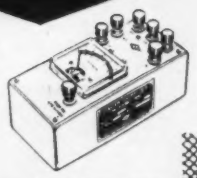
Investigate
these
METER TESTING ACCESSORIES
Now in use by Leading Utility Companies

FIELD TEST SET



This instrument is a simple, inexpensive, portable means whereby the customer's current transformer installation may be quickly checked for basic sources of trouble.

POTENTIAL SWITCH for METER TESTING

This is a special form of the well-known snap action Micro Switch; needs only 6 ounces of pressure to operate it; long lived — modified to suit the requirements of manual control of rotating standard potential.

INSULATION TESTER

Developed in response to the need for an insulation testing device that would have: maximum safety, instantaneous indication, direct reading in megohms without calculations, ability to discriminate between a complete insulation breakdown and leakage through insulation, portability and compactness.

METER TESTING POWER SUPPLY

The purpose of this apparatus is to furnish a stable and controlled source of single phase potential and single phase current for general testing purposes, together with means for adjusting the phase angle so that power may be supplied at any desired power factor, leading or lagging.

Write for Complete Information

EASTERN SPECIALTY CO.
PHILADELPHIA 40, PA.

Catalogs—Bulletins

(*Continued from page* 142)

• **LIGHTING BALLASTS:** "Sola Lighting Ballast" is the title of a 16-page catalog giving technical data, wiring diagrams, electrical and mechanical specification tables for the company's complete line. Write, requesting Bulletin FL-217 from Sola Electric Co., 4633 W. 16th Street, Chicago 50, Ill.

• **TRANSFORMER DATA SELECTOR:** Pennsylvania Transformer Co is offering a slide rule type price and data selector for their equipment. Included are list prices, electrical data, mechanical dimensions for all voltage classes from 3 through 25 kva. Free of charge, write Pennsylvania Transformer Co, Box 330, Canonsburg, Pa.

• **BRUSHES & COMMUTATORS:** A booklet entitled "Carbon Brushes and Commutator Maintenance Team Up to Work for You" is available. It outlines accepted procedures for performing brush and commutator maintenance. Westinghouse Electric Corp, P.O. Box 2099, Pittsburgh 30, Pa.

• **MOTORS:** Allis-Chalmers has recently published several bulletins on their motors. Bulletin 51B7286G covers explosion-proof motors; Bulletin 51B7225D concerns totally enclosed fan-cooled motors; and Bulletin 51B6210G describes the firm's open drip-proof motors. Write Allis-Chalmers Mfg Co, 932 S. 70th Street, Milwaukee, Wis.

• **CENTRIFUGAL FANS:** An 8-page catalog (Bulletin No. 4824) describes new heavy duty centrifugal fans manufactured by American Blower Corp, Detroit 32, Mich. Write to PD Division.

• **CABLE:** A 4-page folder describing Cathode Protection Cable, "Gencathene" and "Aquathene" may be obtained from General Cable Corp, 420 Lexington Ave, New York 17, N. Y.

• **WATER CONDITIONING:** A bulletin on Cochrane Hot Lime-Zeolite water softeners, Publication 4801-A, is available from Cochrane Corp, Philadelphia 32, Pa.

• **GAS DETECTION:** Combustible gas detection equipment is the subject of a specification sheet published by Johnson-Williams, Inc, Box 6, Station A, Palo Alto, Calif.

• **FLUORESCENT FIXTURES:** A six page brochure and catalog on the company's Mohawk series of shallow commercial fluorescent lighting fixtures has been released by Sylvania Electric Products, Inc, 48 Street, Wheeling, W. Va.

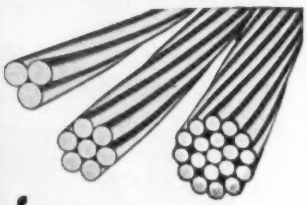
• **TEMPERATURE CONTROLS:** A 6-page catalog describes the complete line of "Thermoswitch" temperature controls of Fenwal Inc, Ashland, Mass.

• **SELENIUM RECTIFIERS:** Bulletin GEA-6545, 12 pages, gives features, application, charts, construction, dimensions, specifications and other data on ¾ to 125 kw selenium rectifiers as well as those of 500 kw multiples. General Electric Co, Schenectady 5, N. Y.

• **NEOPRENE:** "Neoprene Notebook," and "Facts About Hypalon" are two booklets recently issued that deal with chemical resistance of Neoprene and Hypalon. DuPont Co, Wilmington 98, Del.

ACCO Quality

PAGE Stainless Steel Strand



for Severe Service Conditions

PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

Write us at Monessen, Pa., for complete information

ACCO Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

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BOOKS

Received Since Sept. 5

Power System Stability—Vol. III—Synchronous Machines. By Edward Wilson Kimbock. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 322 pages, illustrated. Price $10.00.

Automatic Digital Computers. By M. V. Wilkes. Published by John Wiley & Sons, Inc., 440 Fourth Ave, New York 16, N. Y. 305 pages, illustrated. Price $7.00.

Heat Power Fundamentals. By Carroll M. Leonard and Vladimir L. Maleev. Published by Pitman Publishing Corp, 2 West 45th St, New York 36, N. Y. 527 pages, illustrated. Price $7.00.

Handy Engineering Data Book

Engineering Formulas and Tables, No. 784. Published by Lefax, 9th and Sansom Sts, Philadelphia 7, Pa. 396 pages, illustrated. Price $2.75.

This reference manual contains basic formulas, tables, and design data grouped into 12 subjects. They are: Mathematics, measures, materials, gauges and screws, mechanics, electricity and magnetism, hydraulics, structural data, reinforced concrete, pipe and fittings, steam tables, and mathematical tables. It is printed on 3¾-by-6¾-in., six-holed, loose-leaf sheets bound in paper.

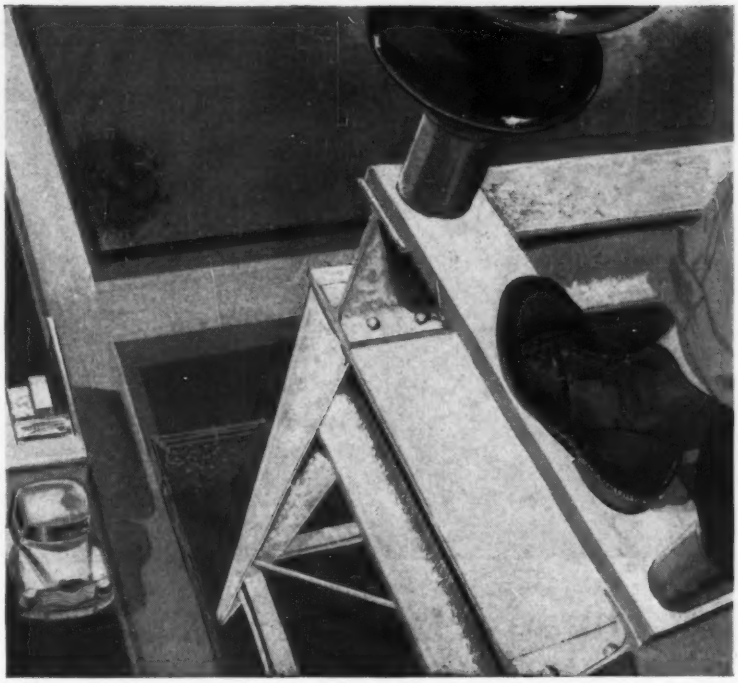
The experienced engineer or the student would find this book helpful because it collects virtually all the necessary working formulas, charts, and tables into one handy manual. The more frequently used sheets or sections can be removed and carried in a pocket loose-leaf binder.

How to Make Precise Measurements

Precision Electrical Measurements. Published by Philosophical Library, Inc, 15 E. 40th St, New York 16, N. Y. 404 pages, illustrated. Price $12.00.

Complete proceedings of a 1954 international symposium on precision electrical measurements are recorded in this book. Twenty-six papers were presented on five subjects: (1) capacitance and dielectrics, (2) inductance and magnetics, (3) electrotechnical measurements, (4) high-voltage measurements, and (5) high-voltage impulse testing techniques. Summaries of discussions held at the end of each session are included.

As most of the papers were presented by persons associated with national research or standards laboratories, this book would be of primary interest to persons engaged in that type of work. However, the 10 papers in the last two categories would be of value to utility engineers.



How high is up?

It feels like 20 stories to a lineman who is finishing his last connection, only to have a connector bolt snap, or the head break off. Small item? Try climbing down and hunting for a spare bolt or, worse yet, find it's a special bolt that you've got to order out.

You won't find these problems with Royal Connectors. Big ½ inch Silicon Bronze hex head bolts are standard on *all* Royal connectors from ½" IPS and larger, and 500 MCM and larger. Nested bolt heads permit "one-wrench" installation.

Insure the fastest, trouble-free installation and a lifetime of dependable service with Royal heavy-duty Power Connectors. And look for the "Royal Treatment" on delivery, too. Call Royal today!

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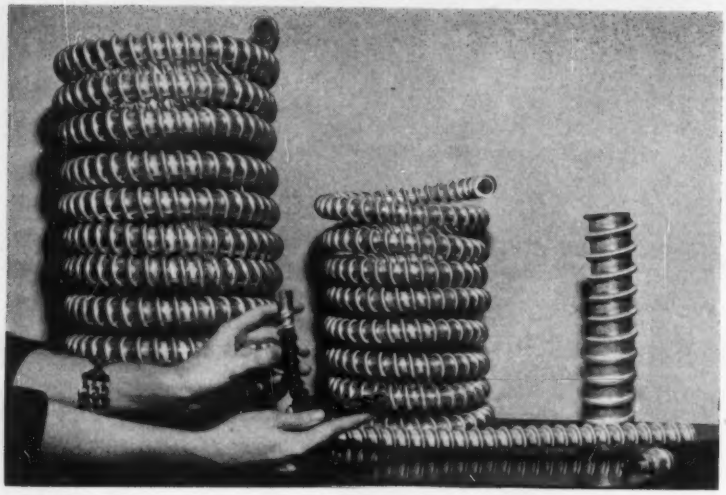
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices



Al Sheath Flexibility Improved

Phelps Dodge to adopt method for corrugating aluminum sheathed cable called 'OKD' for West German maker.

Aluminum sheathed cable with considerable flexibility and reduced wall thickness is the result of a new corrugation method which has been adopted by Phelps Dodge Copper Products Corp of New York, according to Kenneth S. Wyatt, engineer of cables.

This selected method of corrugation, known as "OKD," has been developed by Osnabrucker Kupfer Und Drahtwerk, a West German firm. Wyatt advises that the method has been carefully engineered to satisfy manufacturing, installation and operating requirements of cable for power, industrial and telephone service. Wyatt said that Phelps Dodge has an exclusive agreement with OKD concerning know-how and patents. Equipment is now being installed for its manufacture at an early date.

The OKD corrugated aluminum sheath was introduced by Dr. Karl Hahne of Osnabrucker Kuper Und Drahtwerk in 1952. It is said to be employed at present on all aluminum-sheathed cable OKD makes. This sheath construction was developed after trying the sinusoidal-shaped helical undulations.

Wyatt gave this description. OKD corrugated aluminum sheath features a wide, hollow rib extending outward from the cable insulation and extending helically along the cable length. The rib is so designed that the extra length of metal in it is sufficient to permit a sharp bend around a mandrel 5 times the diameter of the cable. The rib occupies approximately ⅓ the length of the cable, permitting the remaining cylindrical portion of the sheath to make a tight contact with the cable 2/3 of its length. The rib is said not only to greatly increase the cable's flexibility, but to serve also as a channel for drying and impregnating paper cable of the oil-filled type, and to supply gas pressure for low and high-pressure gas-filled cables.

The rib is made by a rotating die external to the soft aluminum tubing, which is somewhat larger in diameter than the cable. The core is drawn into the oversize tubing similarly to the manner using drawndown method. Both core and tube are passed through the rotating die chamber. The process may be used in lieu of the drawdown method; an advantage is said to be greater speed. The outside of the ridge remains very little reduced in diameter so that the aluminum remains soft, whereas the metal in contact with the cable is reduced considerably, and is, therefore, work-hardened. The process reportedly does not change the sheath's length. A plastic jacket can be used over the aluminum sheath where corrosion protection is required.

Advantages of the OKD aluminum sheath relative to smooth sheath are, according to Wyatt: (1) Greater flexibility, allowing the cable to be shipped on reels of smaller diameter, and to be installed where sharp bends are required (OKD bending radius is 5 times its diameter compared to 12 to 30 times for conventional smooth cylindrical sheath;) (2) Reduced wall thicknesses for the same strength requirements; and (3) A duct provided by the rib for oil or gas-filled cables.

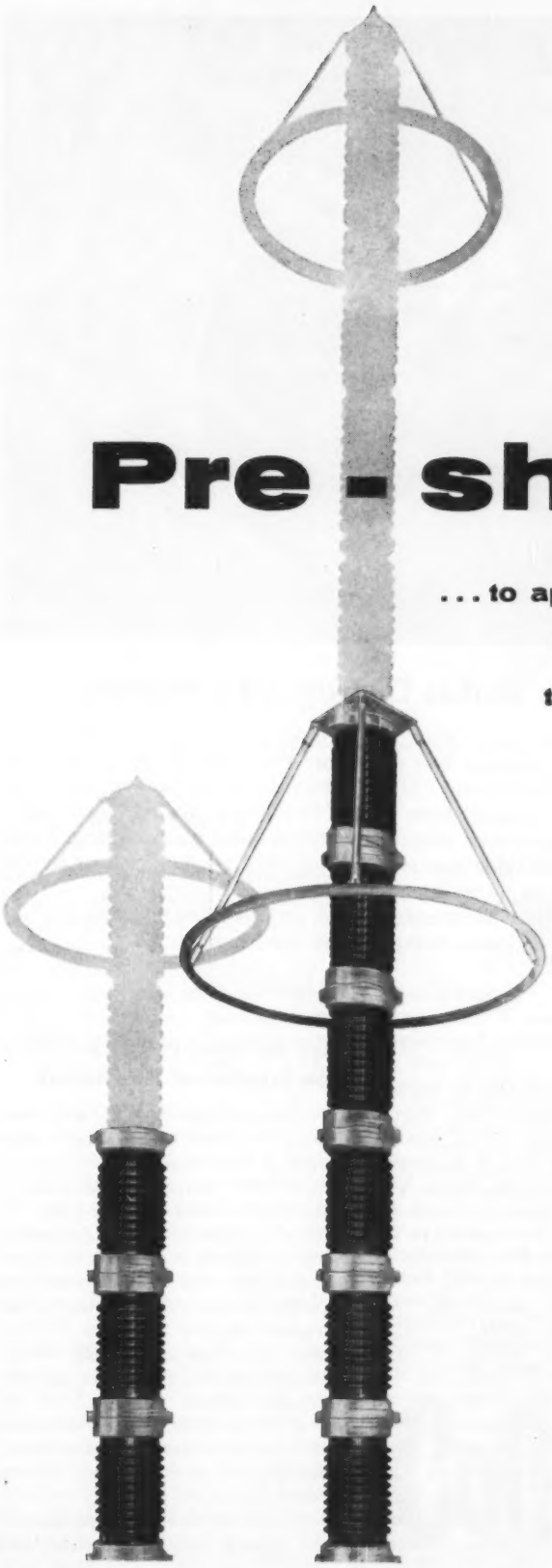
Advantages of the OKD with respect to other corrugated types are, stated the cable engineer: (1) Two-thirds of the sheath length is in contact with the cable, making a tight fit without running the risk of digging into the insulation as is the case with full-wave or sinusoidal corrugation; (2) No overworked metal in the bottom of the groove that would be likely to cause electrical failure; more uniform, not subject to variations in depth during manufacturing.

Aluminum Capacity to Rise During 1957-58 Period

Aluminum production capacity in the U. S. is expected to increase from 1,750,000 tons annually in 1956 to 2,525,000 tons annually in 1958, according to the Aluminum Association, New York. This projected growth is reflected in orders totaling $60 million for alumina reduction equipment placed with two large electrical manufacturers by five major producers, i.e., Aluminum Co of America, Reynolds Metals Co, Kaiser Aluminum & Chemical Corp, Olin Mathieson Corp and Harvey Aluminum, Division of Harvey Machine Co, Inc.

General Electric Co told Electrical World that it has received contracts for more than $35 million from four of these producers. Aluminum Co of America has placed an order for seven pot lines using pumpless rectifier

(*Continued on page* 148)



Pre-shrunk!

... to approximately half-size ...

same ratings ... to help you meet

the squeeze on available space

New Westinghouse SVS self-supporting lightning arresters are little more than half former height — with the same ratings. It's a matter of paralleling elements physically, but in series electrically, in the same housing. Case in point: The 182-kv rating is reduced from 230 inches to 126 inches in height — 18 inches in diameter. 25,000 foot-pound cantilever rating. No supporting structure is needed. Time takes a licking, too, with consequent ease of installation. SVS arresters in the new "pre-shrunk" style are available in all ratings, with the same time-proven quality and modern characteristics of all Westinghouse arresters. Get all the facts from your Westinghouse sales engineer — or write to Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-60892

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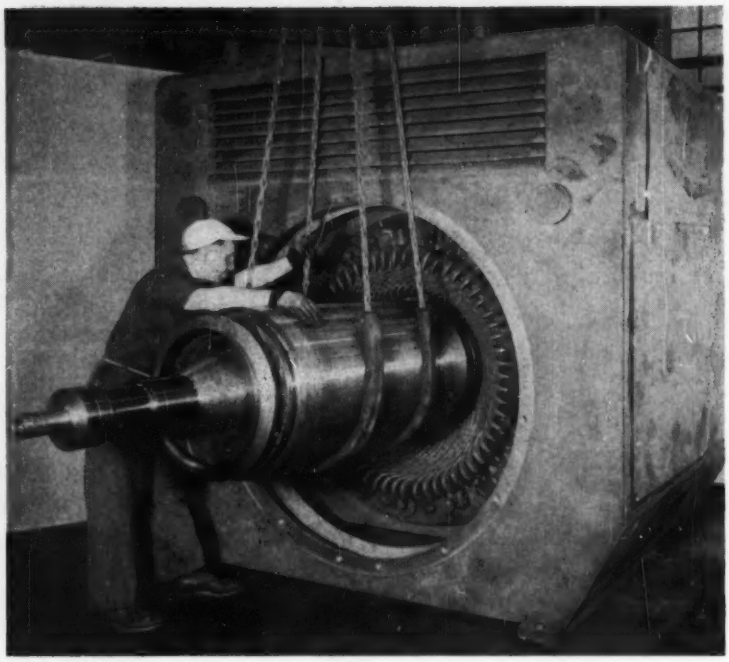


Elliott Co Builds Detroit Ed's Motors

The huge rotor for a 5,000-hp, 3,600-rpm squirrel cage induction motor is shown being inserted into the stator. The motor is one of three for driving boiler feed pumps. These motors are being built by the Elliott Co for Detroit Edison's River Rouge Unit No. 3. Called "super quiet" since the excessive noise usually experienced in the past with large 2-pole squirrel cage induction motors is reduced, they are the first such motors to have been built by the manufacturer to date.

Two of the three are completed, and are being demonstrated to utility executives and operators during October and November.

(*Continued from page* 146)

systems for its plants at Rockdale, Texas, and Evansville, Ind. Reynolds Metals has ordered similar systems to serve three pot lines at its Lesterhill plant in Sheffield, Ala. Kaiser Aluminum & Chemical Co and Olin Mathieson both have ordered package-type pumpless rectifier substations for Kaiser's Ravenswood, W. Va., and Chalmette, La., plants and O-M's Clarington, Ohio, plant.

Westinghouse Electric Corp informed Electrical World that it has on order $25 million worth of rectifier equipment for aluminum producers, namely ALCOA, Reynolds, Kaiser, Olin Mathieson and Harvey Aluminum.

Potlines are used to reduce alumina electrolytically to molten aluminum.

GE to Raise Prices 7-10% on Fractional-HP Motors

General Electric Co will raise prices by 7.5% to 10% on various lines of small motors.

A 7.5% increase on all lines of fractional horsepower ac and dc motors, motor parts and accessories, will be effective November 12, except shaded pole and permanent split capacitor motors which will have a like increase effective December 31. Another exception are hermetic refrigeration motors which had an 8% increase recently.

A 9% to 10% increase will apply to fractional horsepower gear motors and renewal parts, effective November 12.

Present increases cover products of the General Purpose, Specialty, and

Appliance Motor Departments, along with the Gear Motor Transmission Components Department.

H. A. MacKinnon, vice president and general manager of GE's Component Products Division said that this price increase reflects currently increased costs which have caused similar moves in other motor lines.

Burndy Changes Name, Reflecting Wider Scope

Burndy Corporation is the new name of Burndy Engineering Co, manufacturer of electrical connectors and installation tooling, with headquarters at Norwalk, Conn. "The change in name to Burndy Corporation reflects the broadening of the organization's activities," advises Marvin Lee, Burndy's executive vice president.

The company recently reorganized its activities into two divisions. The U-I Division serves utilities and electrical construction and maintenance activities. The Omaton Division serves the original equipment, military and aircraft markets.

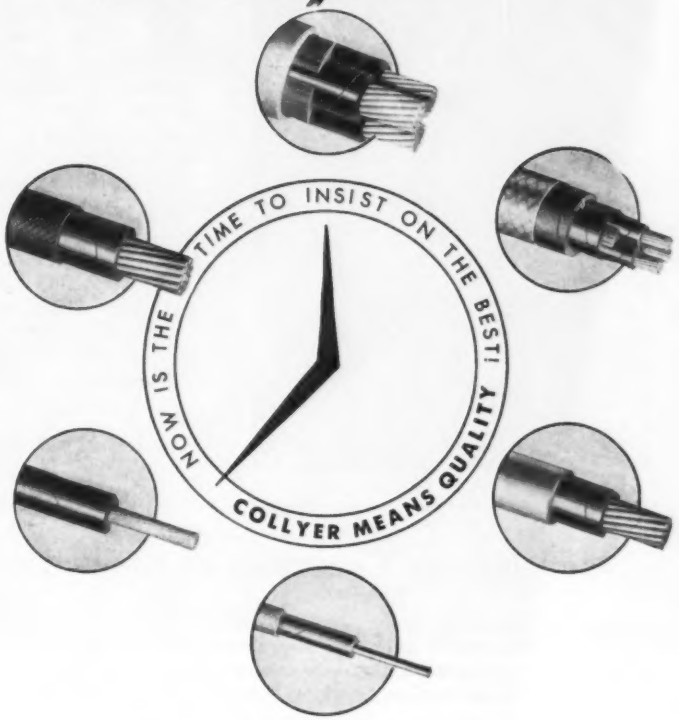
M&M BRIEFS

Circle Wire & Cable Corp, Maspeth, N. Y., a wholly owned subsidiary of Cerro de Pasco Corp, is expanding its operations to include production of wire and cable with aluminum conductors. An initial order for aluminum cable has been received from Long Island Lighting Co, and calls for self-supporting service drop cable.

Schenectady Varnish Co, Inc, Schenectady, N. Y., has announced the first approval by Underwriters' Laboratories, Inc, of their Isonel enameled wire for Class B electrical systems. It is reported that properly designed electrical equipment using Isonel enameled wire could successfully withstand temperatures of 130 C over long periods.

Notifier Manufacturing Co, 239 S. 11 Street, Lincoln, Neb., claims that for the first time a fully automatic fire detection and sprinkler system without mechanical code transmission has been granted Class "A" Proprietary rating. The new system is the result, reportedly, of their invention and development work since 1950.

IT'S *Collyer* TIME!



. . . any time you need

INSULATED WIRES & CABLES

Our product line includes:

Aerial Cables
Apparatus Wires and Cables
Asbestos Insulated Wires and Cables
Asbestos and Thermoplastic Insulated Wires and Cables
Asbestos and V.C. Insulated Wires and Cables
Elevator Control Cables
Grounding Cables
Heavy Duty Portable Cables and Cords
High Voltage Cables
Lead Sheathed Cables
Line Wire
Machine Tool Wires
Mining Machine Cables
Motor and Generator Leads
Network Cables
Neutral Supported Service Cables
Non-Metallic Sheathed Cable (Cablex)
Pole and Bracket Cables
Resistol* Insulated and Sheathed Cables
Rubber Insulated Power Cables
Service Cables
Station Control Cables
Street Lighting Cables
Switchboard Wires and Cables
Tree Wire
Underground Cables
Varnished Cambric Insulated Wires and Cables
Welding Cables

*Resistol is Collyer's Polyvinyl Thermoplastic Resin

Collyer

COLLYER INSULATED WIRE CO.
245 ROOSEVELT AVE., PAWTUCKET, R. I.

Shedd Elected OVEC Executive Vice President

FRED R. SHEDD

Fred R. Shedd is newly elected executive vice president of Ohio Valley Electric Corp, an organization of 15 private electric utilities which provide power to Atomic Energy Commission's Portsmouth, Ohio, project.

Shedd has been associated with OVEC since February, 1953, when he was elected vice president of the corporation. At that time he was also named vice president of Indiana-Kentucky Electric Corp, an OVEC subsidiary.

A veteran of more than 36 years' experience in the electric utility field, Shedd joined the American Gas & Electric Co system in 1919 at Appalachian Electric Power Co's Glen Lyn (Va.) plant. After serving in several engineering capacities throughout the system, he was appointed superintendent of power plants for Ohio Power Co, an AG&E affiliate, in 1943.

Five years later Shedd transferred to Indiana & Michigan Electric Co, an American G&E subsidiary, as assistant division manager of the South Bend Division.

AIEE Names Chairmen of Major Units

American Institute of Electrical Engineers has announced the chairmen of its five new departments and of the 21 general committees for 1956-57. Heads of the new departments, together with general committee chairmen, will supervise activities of committees, especially in matters of coordination and execution of programs.

Chairmen of the new departments are:
Administration—**J. C. Strasbourger**, Cleveland Electric Illuminating Co
Admission & Advancement—**J. L. Callahan**, Radio Corp of America
Publications—**W. Scott Hill**, General Electric Co
Professional Development & Recognition—**W. A. Lewis**, Illinois Institute of Technology
Technical Operations—**W. R. Clark**, Leeds & Northrup Co

General Committee Chairmen for 1956-57 are:
Executive—**M. S. Coover**, Iowa State College
Board of Examiners—**R. A. Heising**, Summit, N. J.
Constitution & Bylaws—**E. S. Lammers, Jr**, Westinghouse Electric Corp
Edison Medal—**E. P. Yerkes**, Bell Telephone Co of Pa.
Education—**E. A. Walker**, Pennsylvania State University
Finance—**T. M. Linville**, General Electric Co
Fortescue Scholarship—**M. N. Lampe**, North Carolina State College
Lamme Medal—**C. W. Franklin**, Consolidated Edison Co of New York, Inc
Management—**L. R. Gaty**, Philadelphia Electric Co
Members-for-Life Fund—**W. C. White**, Northeastern University
Membership—**H. R. Heckendorn**, Western Electric Co
Planning & Coordination—**L. F. Hickernell**, Anaconda Wire & Cable Co
Prize Awards—**B. G. A. Skrotzki**—POWER
Publications—**P. L. Alger**, General Electric Co
Public Relations—**Fischer Black**, Electrical World
Registration of Engineers—**E. R. Whitehead**, Illinois Institute of Technology
Research—**J. E. Hobson**, San Mateo, Calif.
Safety—**H. B. Whitaker**, Underwriters Laboratories, Inc
Sections—**Dixon Lewis**, Aluminum Co of America
Standards—**A. C. Muir**, Berwind-White Coal Mining Co
Student Branches—**W. B. Morton**, Pennsylvania Power & Light Co

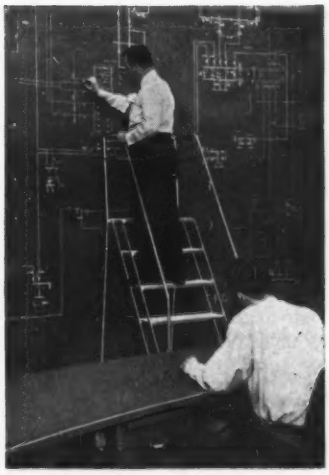
Thomas Named RMEL Head

Rocky Mountain Electrical League, at its recent Annual Fall Convention in Colorado, elected Guy W. Thomas as its president for the forthcoming year.

Thomas, vice president of commercial operations for Public Service Co of Colorado since May of this year, has spent his entire business career in the utility field. Starting with PS in 1919 as junior engineer, he advanced successively to power sales engineer, power sales supervisor, Denver commercial manager, and became general commercial manager in 1953.

This new Systems Operations Center of the Jersey Central Power & Light Company keeps in touch with remote stations through Bell System channels for telemetering and remote control.

Bell System communications help Jersey Central regulate power transmission



Colored pegs in wall diagram indicate segments of line to be isolated for maintenance work.

Channels for telemetering and remote control enable the Jersey Central Power & Light Company to regulate power transmission every step of the way from generator to home, store and factory.

An engineer glances at the dials, which give him a running picture of the system and the changing demands he has to meet—information which has been brought to him by Bell System telemetering channels.

From his position, he switches loads, starts and stops generators and localizes failures—even at distant points—over a network of remote control channels provided and maintained by the Bell System.

If you would like to know more about how Bell System communications can help you, an engineer will be glad to survey your company's needs. There's no obligation. Why not call your Bell Telephone representative today?

BELL TELEPHONE SYSTEM

Private Line Telephone, Private Line Teletypewriter
Channels for: Data Transmission, Telemetering, Remote Control, Telephotograph, Closed Circuit TV

PEA Elects New Officers

Pennsylvania Electric Association vice presidents R. B. Donworth, Duquesne Light Co, and J. O. Chambers, West Penn Power Co, join new PEA President R. P. Liversidge on platform at 49th annual meeting. Liversidge is also vice president of Philadelphia Electric Co. Missing from photo is Harry Ferguson, Pennsylvania P&L second vice president.

Sporn Feted at AG&E Jubilee

Highlight of American Gas & Electric Co's recent 50th Anniversary Dinner was surprise ceremony honoring Pres Philip Sporn, left. Reading citation is Clark N. Porter, residential sales supervisor of Wheeling Electric Co, and 44-year AG&E veteran. Sporn was also given a leather-bound volume containing a scroll with about 13,000 signatures of all AG&E employees.

PERSONAL BRIEFS

Howard Stevenson, formerly assistant manager of sales and assistant manager of operation, has been promoted manager of sales, Detroit Edison Co.

Public Service Co of Oklahoma has announced the promotion of **Lowell Phillips** to Clinton area sales manager. **William Howard,** who formerly held this position, is being transferred to the Chickasha area.

John J. Page joins National Adequate Wiring Bureau staff as national field representative.

Virginia Electric & Power Co has designated **J. Shelton Ragland** as director of commercial sales. . . . Former assistant to the vice president in charge of operations, **John R. Vogel, Jr,** has been appointed system operating engineer for Central Hudson Gas & Electric Co.

Retirement of **Emil Bracht** makes **Dwight W. Roberts** new plant superintendent of Montana-Dakota Utilities Co's Miles City plant.

Karl Meier, new lighting engineer with Black Hills Power & Light Co, replaces **Bob Woosley** who resigned. . . . New Winter Garden district manager for Central Power & Light Co is **William E. Jackson.** He succeeds **V. C. Myrick** who is serving as consultant for CP&L.

Electrical Associates, Inc, has named **Carroll L. O'Shea** president, succeeding **C. Ashmead Biddulph,** new chairman.

Arnold A. Fick replaces **Fred Whitely,** retired, as Fond du Lac district manager of Wisconsin Power & Light Co. **Richard Barry** succeeds Fick as Berlin district manager and **George Byington** replaces Barry as local manager of Spring Green.

Philadelphia Electric Co has upped **Vincent S. Boyer** from assistant superintendent, Cromby station, to superintendent; and **Donald R. Jones** to assistant superintendent. **Burtis E. Hagy** becomes staff engineer of Electrical Engineering Division.

Recently appointed assistant treasurers for Florida Power & Light Co are **Durwood E. Rollins** and **Frank Mergen.**

Former Audubon district engineer at Iowa Public Service Co, **Bill Dyke,** becomes Canton district manager. Dyke is replaced by **Eugene Kohnen.** New purchasing agent at IPS is **W. J. Dougherty,** succeeding **V. H. Pugh,** resigned.

Boston Edison Co's production department has advanced **Howard R. McCarter** from assistant chief of electrical operations to chief of electrical operations. . . . **Waldo C. Bounds,** former Mississippi Power Co Meridian engineer, has been promoted to Laurel Division engineer succeeding **Noel Miller,** resigned.

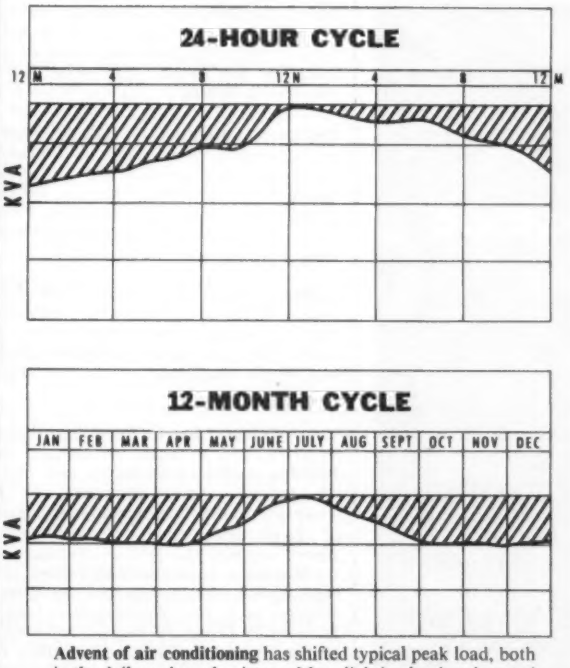
Newly appointed assistant general managers of Allis-Chalmers Power Equipment Division are **L. W. Long** and **J. H. Burrus, Jr.** Succeeding Long as general manager of the Terre Haute

(*Continued on page* 154)

LIGHTING...

your best kind of electric load—and how Sylvania helps you build it

Typical Average Load Diagrams



Advent of air conditioning has shifted typical peak load, both in the daily and yearly picture. More lighting load, as boosted by Sylvania, can help fill the valleys as shown.

Air conditioning, we know, has come into its own as a major appliance load. As a matter of course, this has brought about a change in system peaks to daylight hours during Summer months.

Result: Lighting becomes off-peak load. In effect, it fills valleys in the daily load curve diagram. It improves load factor, increases volume (KWH), and improves power factor.

Sylvania has long subscribed to the policy that increased sales efforts in home lighting can help bring about a marked improvement in the typical residential load curve. For *lighting* is your best kind of electric load. It is steady, consistent, not subject to sudden peaks and fluctuations.

And here's what we are doing about it.

Sylvania has traditionally taken the pioneering lead in new lighting developments. For example, in the past two years we introduced new Softlight under the theme, "decorating with light." With these new pearl-pink incandescent bulbs, we interested housewives in an entirely new concept in light. *More important to you, this created new demand for additional sockets, and demand for greater lamp wattage in existing sockets.*

A stream of successful new lighting developments continues to emerge from Sylvania's laboratories.

At the same time, our representatives have a full set of major promotions which can be tailored to suit your load-building needs. These include ideal "bonus-bulb" and "free-bulb" programs. Sylvania has taken the lead in developing the "Bag-of-Bulbs" program and other suitable wattage builders.

Your local Sylvania representative invites your inquiry. Or if you prefer, write direct to our Better Lighting Headquarters.

SYLVANIA ELECTRIC PRODUCTS INC.
Dept. 6L-2810, Lighting Division, 60 Boston Street, Salem, Mass.

SYLVANIA

. . . fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

1261 ways

to simplify cable splices and terminations . . . with kits and fittings from

PLM

PLM Splicing and Terminating Kits eliminate need for time-consuming planning and ordering . . . provide everything needed, in one package, for correctly designed splice or termination.

● Here's new, fast help in figuring and ordering cable splicing and terminating needs! This new, 52-page PLM Catalog 301 lists and illustrates PLM unit package kits and fittings in hundreds of standard sizes and ratings, through 23 kv . . . simplifies ordering and specifying special requirements. Whether your needs are for standard or special armored cable fittings . . . 2, 3 or 4-way splices in or to armored cable, non-metallic sheathed cable or lead-covered cable, you'll find answers, fast, in PLM products. Write for PLM Catalog 301 today, or ask for quotations.

PLM PRODUCTS, INC. · 3873 West 150th Street · Cleveland 11, Ohio
WIRE AND CABLE FITTINGS AND ACCESSORIES

Works is **A. I. Thorsen,** former assistant director of manufacturing of the Industries Group. In addition, **Howard C. Carless** has been named engineer-in-change of medium transformers at Terre Haute and **B. A. Storaasli** becomes supervisory engineer of medium transformer design, Terre Haute.

Sylvania Sales Corp and Victor H. Meyer Distributing Corp, both subsidiaries of Sylvania Electric Products, Inc, have elected **Forest W. Price** president. . . . New controller of Sylvania's Atomic Energy Division is **Garth W. Edwards.** He succeeds **Emerson S. Norris,** now manager of facilities engineering for the division.

SALES ASSIGNMENTS

COMPANY STAFFS

Bristol Co's new western sales office in Denver, Colo., has been placed under the management of R. G. Tower.

H. K. Porter Co, Inc, has opened new branch offices of its Delta-Star Electric Division in Los Angeles, Birmingham, and Pittsburgh, to be headed by G. A. Palka, L. S. Belding, and J. F. Zboyovsky, respectively. H. L. Cadwallader will serve as assistant district manager of the Pittsburgh office. The new offices will serve in the combined sales activities of Delta-Star and Porter's acquisition, Electric Service Works.

Preformed Line Products Co's new eastern regional sales supervisor is Edmund H. Brown. His territory will consist of Maine, New Hampshire, Vermont, Rhode Island, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, and Washington, D. C.

Southern States Equipment Corp has appointed Glenn L. McDuffie Southwest district manager, with headquarters in Dallas, Tex. District Representative Roy McCowen's new territory is the Hampton, Ga., area.

Westinghouse Electric Corp has designated Richard F. Tuson as manager of Portable Appliance Division's new Middle Atlantic region, composed of 14 wholesale trading areas previously part of the Eastern region. . . . William J. Brown assumes the post of manager of the Rochester apparatus sales office. . . . New region sales manager of the southwestern area for Westinghouse Lamp Division is David H. Nelson, who will headquarter in St. Louis. . . . William J. Livermore has been named Southern California district manager of major appliances, succeeding R. F. MacGillivray, who was transferred to San Francisco as Pacific Coast regional sales promotion manager for major appliances.

Vennard Charges U. S.

(*Continued from page 67*)

modernization of basic industries, textile industry migration, and the decline in the anthracite industry. He inferred, however, that power rates, "not everywhere as advantageous as industry and other consumers wish," contributed to Pennsylvania's failure to attract the Ohio Valley aluminum plants. Citing Ohio Valley Electric Corp's ability to sell power at 3.851 mills, Leader said that the public will come to expect "more of this sort of thing."

Utilities have received increasing benefits from their allies in the electrical industry, said George F. Whitwell, retired vice president, Philadelphia Electric Co. Key to industry progress, he said, is recognition that the public must be sold on the benefits of electrical living.

Utility Allies Cited

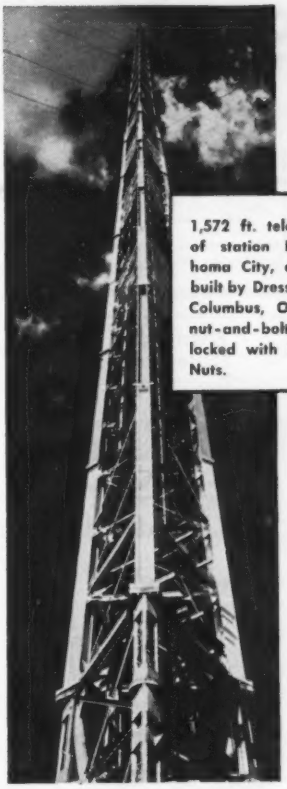
Besides utilities and their employees, Whitwell numbered among the allies the electrical industry associations and magazines, and publications in the news, women's, shelter, and agricultural fields. Rural programs, home builders, business associations, and lighting bureaus have contributed, he said, noting that the best gauge of results is the growth of energy sales.

Management today must assure competent succession, declared F. L. Larkin, vice president, Wisconsin Electric Power Co, in describing his company's program for discovering management talent.

Processing 571 persons, he said, permitted preparation of a "balance sheet of management manpower," whose findings guide each promotion and transfer. He added that the program disclosed enough "buried" talent to fill every company requirement.

Panama Utility Expands

Increased industrialization in the Republic of Panama, caused by the new Panama Canal treaty, has led Cia. Panamena de Fuerza Y Luz to start construction of a 7,500-kw extension on one if its steam-electric plants to meet increasing power consumption. It is scheduled for 1959 completion. The company is a subsidiary of American & Foreign Power Co.

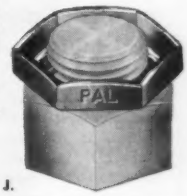


World's tallest man-made structure
equipped with
PALNUT LOCK NUTS
Trademark

1,572 ft. television tower of station KWTV, Oklahoma City, designed and built by Dresser-Ideco Co., Columbus, O., has many nut-and-bolt assemblies locked with PALNUT Lock Nuts.

- Prevents loosening of nuts and bolts
- Eliminates checking and retightening

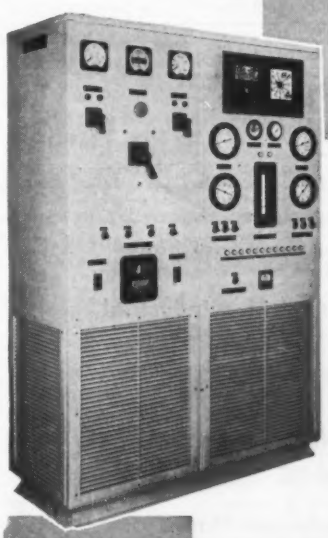
For up to 20 years, PALNUT Lock Nuts have been universally specified on AM, FM, TV and signal Corps towers, and extensively used on transmission towers and sub-station structures. Low in cost, easily applied and absolutely secure. Hot dip galvanized to exceed ASTM specifications. Specify PALNUTS for your towers. Samples on request.



The PALNUT Company
51 Glen Road, Mountainside, N. J.

CUSTOM-BUILT

INSTRUMENT PANELS
CONTROL PANELS
CUBICLES



Class 799
Engine Control Panel

Let us quote on your requirements

Nelson Electric Mfg. Company has specialized in developing the skills that are required for producing instrument and control panels that meet, in every detail, the specifications of each customer.

We render a complete engineering service if desired. We do all fabricating and assembling, all wiring, all piping and all testing. Bare panels, without instruments, can also be furnished.

Write for a copy of our new "Pictorial Index".

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant | Civil Service Opportunities | Employment Agencies
Positions Wanted | Selling Opportunities Wanted | Employment Services
Part Time Work | Selling Opportunities Offered | Labor Bureaus

NATIONAL COVERAGE

RATES

DISPLAYED

The advertising rate is $19.15 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—8 columns—30 inches to a page.

Subject to Agency Commission.

UNDISPLAYED

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to Classified Advertising Div. ELECTRICAL WORLD, P. O. Box 12, N. Y. 36, N. Y.

Wanted

MANUFACTURERS' REPRESENTATIVE

calling on industrial plants and utilities

Our client, a nationally known manufacturer of electrical specialties, is expanding his sales force. If you are a top-notch sales agent, covering your area thoroughly, he may have an opening for you . . . sure to prove extremely profitable in the years to come.

If you're interested, we'd appreciate a letter from you stating full details and a list of the lines which you presently represent.

Walter J. Werbos, *Vice President*
BRIDGE RESEARCH BUREAU
Suite 500
1201 Chestnut Street
Philadelphia 7, Pa.

Electrical Engineers Designers

BECHTEL

Offers you immediate long range engineering opportunity in

San Francisco or Los Angeles California

Engineers, designers and draftsmen required with the following experience:

Electrical Sub-Station
Hydro-Electric Power Plant
Steam Electric Generating Station

Liberal relocation allowances for you and your family

Send Resume to
Manager of Employment and Placement
Industrial Relations Division

BECHTEL CORPORATION
220 Bush Street
San Francisco 4, Calif.

For an immediate personal interview you may phone:
Paul Keating, Plaza 7-4400, New York City
Joe Braddick, Fairfax 3-2401, Houston, Texas
Bill Milligan, Tucker 1549, Los Angeles, Calif.
Don Palmer, Douglas 2-4032, San Francisco, Calif.

ELECTRICAL DESIGNER — ENGINEER

Are you looking for an opportunity in a progressive North Jersey non-defense industry with liberal employee benefits? We have an excellent opening for a man with electrical drafting experience. Range drive and control background desirable but not essential. Will consider man with or without E. E. degree. Why not write with resume and salary desired to

P-3290, Electrical World,
Class. Adv. Div., P.O. Box 12, N. Y. 36, N. Y.

SR. ELECTRICAL ENGINEER

Foreign Employment

For responsible staff position which involves planning and staff engineering of new electrical power generation plants utilizing steam or gas combustion turbines and related facilities for major oil installation in Saudi Arabia.

Must be a graduate electrical engineer with proven supervisory ability with minimum ten years' experience in planning, design and study of utilities systems, power generation, transmission, distribution and related work. Minimum salary $1000 monthly plus allowances and generous benefits.

Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 180

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

DESIGN ENGINEERS ELECTRICAL CABLE

In New Jersey—positions with large insulated wire and cable manufacturer for engineers up to 35 years old with 5 to 7 years experience. Experience in design of rubber and paper insulated cables, high voltage cables, etc. Permanent positions. Salary commensurate with experience. Write stating age, education, experience and salary desired.

Address

P-2939, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

ELECTRICAL ENGINEER

Electrical Engineer interested in electrical design of power plants or industrial plants. Experience not required.

Excellent opportunity with consulting engineering firm in Middle West. Liberal benefit plans and good working conditions.

Send resume of education and experience with statement of salary requirements to:

P-3234, Electrical World,
520 N. Michigan Ave., Chicago 11, Ill.

GENERAL SUPERINTENDENT

20,500KW Industrial Steam Power Plant large city Colombia, South America excellent climate year round. Start January. Annual salary about $10,000 00. Knowledge Spanish not required. Write triplicate full details family status, education, experience, references.

S. J. BRISBIN COMPANY
75 West Street New York 6, N. Y.

COMPONENT ENGINEERS

Electrical Mechanical Chemical Industrial

for

Development • Design • Manufacturing Engineering • Factory Supervision

on

TRANSFORMERS • MAGNETIC AMPLIFIERS
POWER SUPPLIES • VOLTAGE REGULATORS

Contact Manager Transformer Plant

RAYTHEON MFG. CO., 190 WILLOW ST.
WALTHAM, MASS.
Tel: TWinbrook 3-5860, Ext. 2101

RAYTHEON

Don't forget the

BOX NUMBER

When answering the classified advertisements in this magazine don't forget to put the box number on your envelope. It's our only means of identifying the advertisement you are answering.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

UNDISPLAYED RATE:

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.50 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $14.00 per inch for all advertising apearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

SEND NEW ADVERTISEMENTS TO Classified Advertising Div. of ELECTRICAL WORLD, P. O. Box 12, N. Y. 36, N. Y.

FOR SALE

5—OIL CIRCUIT BREAKERS

Whse. late type, outdoor type, De-Ion Grid, T.P.S.T., Rated 161000 V., 1200 amps., 60 cy., 3 ph., Type GO-3, Interr. Duty 1,500,000 KVA.

Fully complete—Cond. like new.

Price and further inf. upon request.

PHILADELPHIA TRANSFORMER CO.

BOX 566 DALTON, PA.

---

10 MOTORS

WESTINGHOUSE LIFE LINE

200 H. P.
Like New

1780 RPM, 3 Phase
60 Cycle, 440 Volts
$800 each

(Subject to Prior Sale)

SABIN METAL CORP.

310 Meserole St., Brooklyn 6, N. Y.
EVergreen 1-5000

Buying

Good USED Equipment

is frequently the difference between having needed equipment or doing without it.

BOOKS AND PERIODICALS

A.I.E.E. Transactions wanted to buy for cash and other technical and scientific periodicals. E. W. Ashley, 27 E. 21, N.Y.C. (10)

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1125 W. 6th St. (17)

POSITION VACANT

Wanted: Electric utility in Southeast desires graduate EE for its planning department. Prefer person with 3 to 5 years experience. Excellent opportunity. Write fully, giving academic training, experience, salary requirements, other pertinent information. P-3258, Electrical World.

We are currently buying

GERMANIUM - RESIDUES

for the further processing of Germanium-Dioxide and Germanium-Metal.

OTAVI MINEN - und Eisenbahn-Geselischaft

Hynspergstrasse 24,
Frankfurt/Main (Germany).

ELECTRICAL WIRE AND CABLE

—YOUR BEST SOURCE—

- for every industrial and power application
- Odd lengths—long and short—reasonably priced

One of the Largest Stocks in the Midwest

Let us quote on requirements—
send your inquiries
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Branch Office:
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SQUIRREL CAGE MOTORS

3 phase, 60 cycle, 220 or 440 volts
(* 2300 volts or higher)

H.P.	MAKE	TYPE	SPEED
75	Al-Ch	AR	900
75	G.E.	CTR-552	900
*75	Westg.	CS-762C	900
75	Al-Ch	AR-226C	900
75	G.E.	HK	720
75	G.E.	HK	514
60	G.E.	KT-337	1800
60	*G.E.	KT-337	1800
60	G.E.	KT-332	1500
60	Al-Ch	APZ-5041U TEFC	1200
60	Al-Ch	AR-5041U	1200
60	G.E.	K-505	1200
60	G.E.	KF-505	1200
60	Al-Ch	ART-505	1200
60	Al-Ch	ARX-623	900
60	Al-Ch	AR-5230	900
60	Westg.	*CS-762S	900
60	Westg.	CS-762C	720
60	Cr-Wh	AQ-113	720

CHICAGO ELECTRIC CO.

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FOR SALE
1875 KW MOTOR GENERATOR SET

1875 KW General Electric generator, 250 volts direct current, direct connected 2600 HP General Electric synchronous motor, 3 phase, 60 cycle, 11,000 volts, 600 RPM, complete with automatic switchgear. Excellent condition.

INTERNATIONAL POWER MACHINERY CO.
Union Commerce Bldg. Cleveland 14, Ohio

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FOR SALE

3—1000 KVA Mol 11500-2400/4160Y
3—1000 KVA Mol 13200-2400/4160Y
3— 500 KVA W-H 33000-2400/4160Y
3— 500 KVA G-E 22000-2300/4000Y
3— 500 KVA G-E 13200-240/4160Y
3— 333 KVA A-Ch 14400/14100/13800/13500/13200-240/480
3— 250 KVA G-E Ditto
3— 167 KVA W-H Ditto
6— 250 KVA W-H 22000-7200/12470Y
3— 200 KVA Mol 7200/12470Y-2400/4160Y
4— 100 KVA A-Ch 33000-7200/12470Y
4— 100 KVA W-H 22000-6900/11950Y

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.

5316 Hetzel St.
Cincinnati 27, Ohio

40 Years' Dependable Service

OFFICE EQUIPMENT AVAILABLE

Because of a change in procedure, a utility is now offering for sale miscellaneous cabinets and office equipment used for customer billing and several each of the following:

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Type 3400
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Please address inquiries to
M. G. SULLIVAN,
Niagara Mohawk Power Corporation
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LARGE POWER EQUIPMENT

Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?

BELYEA COMPANY INC.
51 Howell St. Jersey City, N. J.

Investors Wary of Low Earnings

New York banker advises RMEL that utilities should go after necessary rate increases. Forsberg calls for nationwide public relations program

The threat of inadequate earnings is a serious consideration from the investor's view, John F. Childs, vice president, Irving Trust Co, New York, told the 53rd annual convention of the Rocky Mountain Electrical League, Colorado Springs, Oct. 7-10.

Capital must be treated fairly, but not all regulatory commissions give full consideration to this requirement. Childs called for an improvement in the regulatory climate as well as aggressive action, not timidity, on the part of management to ask for necessary rate increases.

He suggested a continuous study of financial performance be carried on to assure that facts are available to support requests for rate adjustments. Childs asserted that the investor might well view continuing efforts to socialize the industry as the greatest threat, with the seriousness increased by the advent of nuclear power. Utility management should convince the public that the cost of electricity is not only reasonable but cheap, that private companies provide the best service, and that customers are fully protected by regulatory agencies against monopolistic practices.

The sentiments of Childs were reinforced by Carl J. Forsberg, president, Wisconsin Power & Light Co. It is time the industry did more than just "talk to itself." Forsberg said a public information program on a national scale is the one great thing the industry needs. Utilities in Wisconsin, he added, are now fully behind PIP, having observed the value of informing the public during a time of strong agitation for government control of utilities in that state.

Consideration must be given to broadening and accelerating of individual company efforts in the nuclear power field, stated E. H. Dixon, president, Middle South Utilities, Inc. "There is a tremendous job to be done. Let's face it, if the industry doesn't do it, the government will." He expressed the view that the Atomic Energy Commission is receptive to requests for research and development aid for definitive power reactor projects which, in ABC's opinion, would advance reactor technology.

Looking to expected Congressional hearings on atomic energy next spring, Dixon said, "No matter how broad a program we report next year, socialized power zealots will say it is inadequate. But if our program is broadened through the undertaking of new projects by companies not now participating in nuclear power projects, this would carry great weight with fair-minded members of Congress."

We are building a foundation for atomic leadership among nations, said F. K. McCune, vice president, Atomics Products Division, General Electric Co. Without letting slip our military advancement of atomic energy, we are moving ahead in the peaceful utilization of the atom.

Tell About Real 'Giveaway'

The utility industry has the obligation of telling the American people of the real "giveaway" in the country today, stated J. E. Corette, president, Montana Power Co. This giveaway might be more aptly termed a "takeaway." Through promotion of tax-exempt federal power projects, there is a taking away of the American right to pay for and own property, of the freedom of choice in the matter of electric service, and of the opportunity for greater security through a constantly increasing and unfair proportioning of taxation. Unless the tax situation is equalized and discriminatory tax advantages are removed, the industry will be on the direct road to socialization.

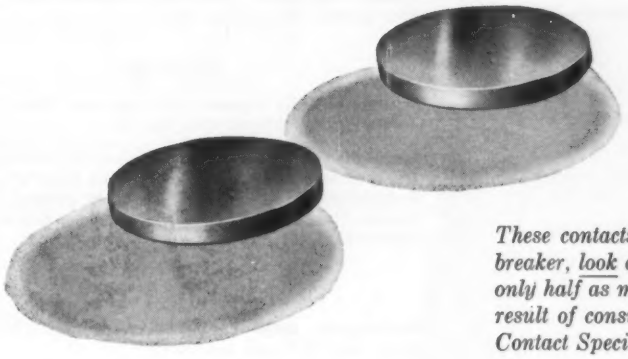
Other industries, particularly the railroads and the oil companies, are doing a much better job of informing the public of their objectives and accomplishments, said Donald S. Kennedy, president, Oklahoma Gas & Electric Co, and of Edison Electric Institute. Because a large segment of the electric industry is against combining the four national associations, the main effort now is to eliminate the duplicate services provided by these groups so that the industry's story can be told in the most efficient manner.

The position of quarterback of automation, instead of cheerleader, is the challenge the industry must accept, urged P. T. Lagrone, Westinghouse Electric Corp. He cited these points which must be understood before automation will be accepted and put into greater use: Automation is simply one more step in this country's history of industrial progress; the change to automated processes will be gradual and natural; with or without automation, this country faces a shortage of labor in the coming decades; and to survive and prosper in the second half of this century, there is no choice but to progress further into automation.

There are five intangible qualities which underlie successful management, said Dr Charles E. Irvin, Michigan State University professor. These qualities, which are communicated to others only by example, are: Faith in something bigger than the man himself; individuality, or the courage of one's conviction; enthusiasm; the capacity to keep an open mind, to create new ideas, and to inspire others; and a sincere devotion to the interests of others.

These improvements are the most urgently needed now in federal water resource and power development, said Charles D. Curran, consulting engineer, who served with the Hoover Commission Task Force. Establish in the office of the President an independent water resources and power board and strengthen the independent review facilities of his office. Require that vendible surplus products, particularly water for municipal supply and electric energy, be sold at their real value. Establish by law, basic and broad principles of a federal water policy. Require greater local participation in the planning, financing, and operating of water resources development projects, with immediate and direct beneficiaries making substantial contributions.

MALLORY



These contacts, for a utility circuit breaker, look alike . . . but one costs only half as much as the other, as a result of consultation with Mallory Contact Specialists.

How Mallory Contact Engineering Balances Performance and Price

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design . . .** for your purchasing, production and product needs.
3. **The most economical backing material** . . . from a group of Mallory alloys developed for this use.
4. **The most economical backing member design . . .** in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

CONTACTS can be *too good* for their intended service. Detailed study of a contact application, by Mallory engineers, often uncovers ways to design more closely to actual requirements . . . at substantial savings to the customer.

The contact pictured above is a typical example. Intended for use in a circuit breaker for utility distribution lines, it originally was designed with contacts made of heavy-duty silver ELKONITE®. At first glance, this exceptionally long-wearing, high conductivity metal appeared ideal to meet the customer's original specifications. But further investigation by Mallory contact engineers revealed that while contacts had to operate with absolute dependability, they did not have to function *frequently*.

On the basis of the actual frequency of service expected, Mallory engineers recommended a change to a copper ELKONITE . . . an alloy made of lower priced materials, and more economical to produce. Overall savings to this customer amounted to a 50% cut in contact costs. Moreover, there is no sacrifice in performance for the specific application.

Chances are that consultation by Mallory on your own contact applications can prove the source of interesting savings for you. Mallory engineers are well qualified by years of experience to analyze your requirements, to recommend materials from the extensive line of Mallory alloys, and to assist in overall design of contacts and assemblies. For a discussion, write or call Mallory today.

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Electromechanical—Resistors • Switches • Tuning Devices • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals • Welding Materials

MEETINGS CALENDAR

OCTOBER

Edison Electric Institute—Wiring Promotion Committee, Cherry Hill Inn, Haddonfield, N. J., Oct. 29-30.

American Institute of Electrical Engineers—Farm Electrification Conference, Hotel Peabody, Memphis, Tenn., Oct. 29-31.

Montana State Rural Electric Cooperative Association—Annual Meeting, Lewiston, Mont., Oct. 29-31.

• **Electric Companies Advertising Program**—Copy Group Meeting, N. W. Ayer Studio, RCA Bldg., New York City, Oct. 31.

Electrical Management Society—Hotel Sherman, Chicago, Ill., Oct. 31-Nov. 2.

NOVEMBER

Pennsylvania Electric Association—Transmission and Distribution, Shenango Inn, Sharon, Pa., Nov. 1-2.

• **Edison Electric Institute**—Accounting Division, Advisory and Executive Committee, Hotel Statler, St. Louis, Mo., Nov. 1-2; Electric Space Heating & Air Conditioning, Indianapolis, Indiana, Nov. 1-2; Sales Personal & Training Committee, New York, N. Y., Nov. 2; Commercial Lighting Committee, Shoreham Hotel, Wash., D. C., Nov. 8-9; Residential Group Chairmen, St. Louis, Mo., Nov. 8-9; Industrial Relations Committee, EEI Headquarters, New York, N. Y., Nov. 15; Industrial Power & Heating Group, Detroit, Mich., Nov. 15-16; EEI-AGA General Accounting Committees, Henry Grady Hotel, Atlanta, Ga., Nov. 26-27; Accident Prevention Committee, Statler Hotel, Hartford, Conn., Nov. 26-28.

National Rural Electric Association—Region Nine Annual Meeting, Davenport Hotel, Spokane, Wash., Nov. 12-13.

National Electrical Manufacturers Association—Annual Meeting, Traymore Hotel, Atlantic City, New Jersey, Nov. 12-16.

Pacific Coast Electrical Association, Inc—Administrative Services Section, Hotel Biltmore, Santa Barbara, Calif., Nov. 14-15.

American Society of Refrigerating Engineers—43rd Semi-annual Meeting, Hotel Statler, Boston, Mass., Nov. 25-28.

Inland Empire Waterways—23rd Annual Convention, Chinook Hotel, Yakima, Washington, Nov. 26-27.

American Society of Mechanical Engineers—22nd National Exposition of Power and Mechanical Engineering, Coliseum, New York, N. Y., Nov. 26-30.

Third International Automation Exposition—New York Trade Show Bldg., N. Y., Nov. 26-30.

Great Lakes Conference of Railroad and Utilities Commissioners—First Annual Convention, Greenbrier Hotel, White Sulphur Springs, W. Va., Nov. 29-30.

DECEMBER

Institute of Radio Engineers—2nd Instrumentation Conference, Biltmore Hotel, Atlanta, Ga., Dec. 5-7.

Edison Electric Institute—1957 Conference Planning Committee, sponsored jointly with American Gas Association, EEI-AGA Headquarters, New York, Dec. 6-7; Street Lighting Committee, Dayton, Ohio, Dec. 6-7; Commercial Cooking & Water Heating Committee, Cleveland, Ohio, Dec. 13-14.

JANUARY, 1957

Northeastern Weed Control Conference — Sheraton-McAlpin Hotel, New York City, Jan. 10-12.

Doble Engineering Co—24th Annual Conference of Doble Clients, Sheraton Plaza-Hotel, Boston, Massachusetts, January 14-18.

• **Southeastern Electric Exchange** — Personnel Administration Section Meeting held jointly with EEI, Sheraton-Park Hotel, Washington, D. C., Jan. 17-19.

American Institute of Electrical Engineers—Winter General Meeting, Hotel Statler, New York, Jan. 21-25.

Missouri Valley Electric Association—Industrial & Commercial Sales Conference, Hotel President, Kansas City, Mo., Jan. 31-Feb. 1.

FEBRUARY

National Association of Purchasing Agents—26th Annual Mid-Winter Conference, Public Utility Buyers' Group, Brown Hotel, Louisville, Ky., February 3-5.

Electric Institute of Washington—Electrical Trade Conference & Exposition, Shoreham Hotel, Washington, D. C., February 12-14.

American Society of Heating and Air-Conditioning Engineers—63rd Annual Meeting, Chicago, Ill., Feb. 25-28.

Pacific Coast Electrical Association — Business Development Section, Sheraton-Palace Hotel, San Francisco, Calif., Feb. 28-Mar. 1.

• Additions this week.

Pearl Cites Power's Role In Forest Industry Output

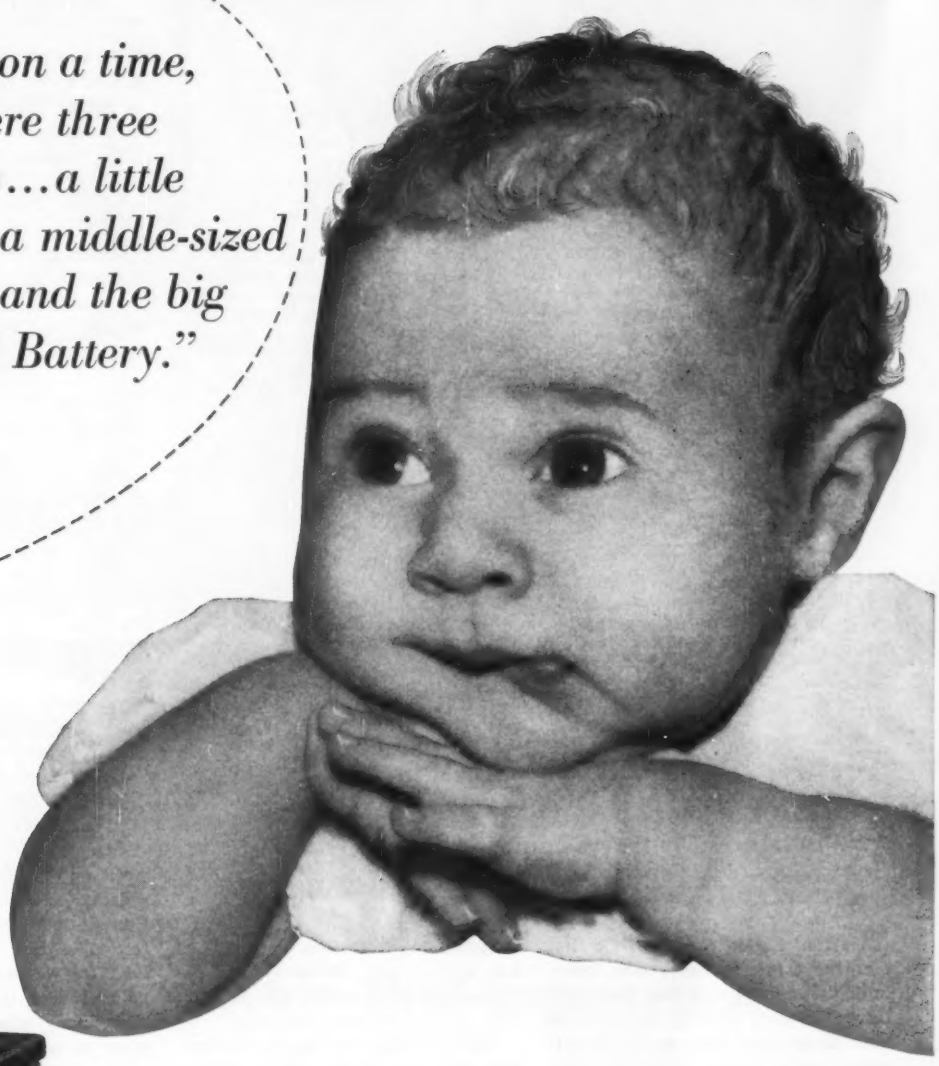
Pacific Northwest forest products industries—lumber, plywood, pulp, and paper mills—consumed more than 4 billion kwhr of electricity in 1955 and will require 185% of this by 1980, according to Bonneville Power Administrator William A. Pearl.

Pearl told the Forest Industries Forum for Washington and Oregon the hydroelectric potential and the forestlands of the two states represent the region's most important "sustained yield natural resources." He said cooperation between the federal government and public and private companies in both fields—power and forestry—were making possible the fuller utilization of the resources on which the states are so dependent. Pearl said the power load of the forest products mills was second only to the electro process industries, namely aluminum and chemicals.

Detailing the power growth, Pearl said "Since May 1954, ten of 30 new non-federal power projects proposed by public and private groups have been licensed for construction by the Federal Power Commission and have a nameplate rating of over 3,200,000 kw. Six of the ten projects with an installed capacity of 1,650,000 kw are already under construction."

He compared the dams under construction by nonfederal utilities as equal to more than six projects of capacity of Bonneville, the oldest federal hydroelectric dam on the Columbia River.

"Once upon a time, there were three batteries...a little battery, a middle-sized battery, and the big ***gould*** *Battery."*



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GOULD PLANTÉ
The Aristocrat of Stationary Batteries

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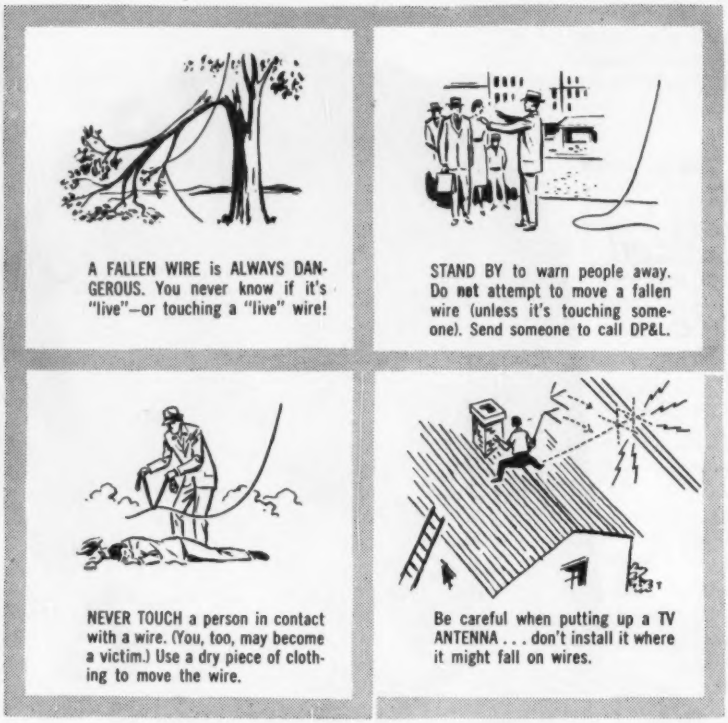

A FALLEN WIRE is ALWAYS DANGEROUS. You never know if it's "live"—or touching a "live" wire!
STAND BY to warn people away. Do not attempt to move a fallen wire (unless it's touching someone). Send someone to call DP&L.
NEVER TOUCH a person in contact with a wire. (You, too, may become a victim.) Use a dry piece of clothing to move the wire.
Be careful when putting up a TV ANTENNA . . . don't install it where it might fall on wires.

'Fallen Wire' Warnings . . .

. . . issued by Dayton P&L in series of ads, stories, talks. Will get national attention in TV movie

Dayton Power & Light Co has quit the ranks of those who hush-hush the dangers of fallen wires and taken the story of their dangers and what to do about them to fire departments, police groups, luncheon clubs and rescue squads in their service area. The story has been told to: 110 fire departments, a total of 1,600 firemen; 47 state and local police groups, 600 men; 13 luncheon clubs, 400 people; 6 rescue squads, 100 people. Total 176 groups, 2,700 people.

The story is told by district managers, superintendents and foremen after they have been given a course of training by the safety department. Talks have gone into detail on the safeguards taken and the methods used in distributing electricity. However, attention is always called to the fact that you can never tell about a fallen wire. It may be energized and dangerous. Precautions to be taken are spelled out. Meetings are developed as fully as the groups wish. The activity is being continued.

Ads are being run in the newspaper with the theme "Be sure you know these safety rules about wires." Copies of these ads (cut above) were sent to all schools for their bulletin boards. Publicity stories were run in the newspapers.

The National Association of Manufacturers has made a movie of what Dayton is doing to tell the "Fallen Wire" story. It is scheduled to appear this fall on the TV program "Industry on Parade."

In its campaign, the utility emphasizes that every possible safeguard has been engineered into the modern electric system to automatically shut off the energy when a wire falls, but that freak accidents do occur.

ADVERTISING BRIEFS

What's new? Public Service Electric & Gas Co is running a series of ads in college newspapers and magazines in an effort to recruit engineers and other personnel. Ads play up benefits of living in New Jersey close to seashore and metropolitan areas.

Houston Lighting & Power Co urges customers to "convert summer cooling power to extra warmth in winter" in ads pushing portable and fixed heating equipment.

Georgia Power Co presents "The Case of the Startled Shopper" in one of its series of ads discussing costs of electric power. These compare purchasing power of today's dollar with that of 1945 for such items as food, clothing, and electricity.

PUBLIC RELATIONS BRIEFS

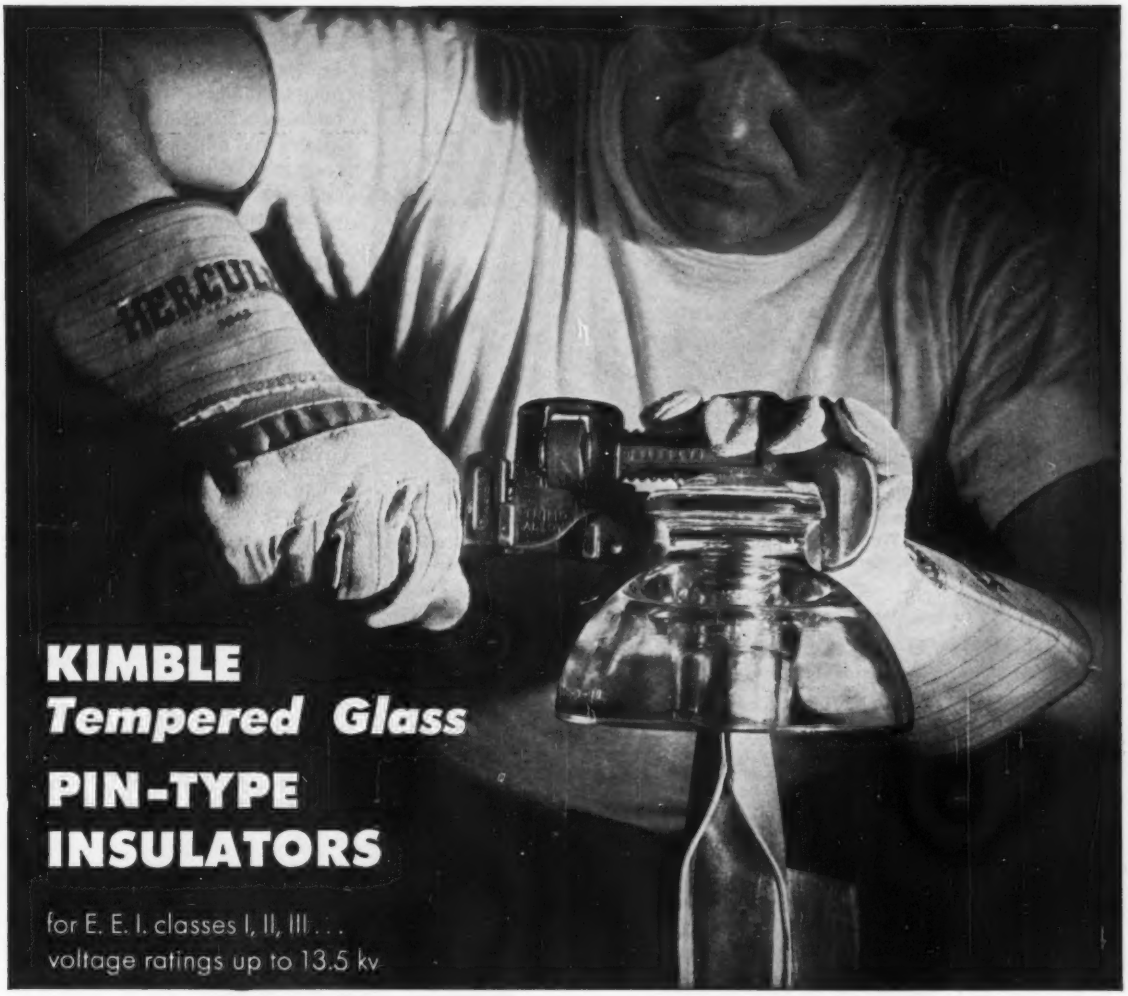
Safety comic book featuring the loveable little demon "Dennis the Menace" published by the National Safety Council is being distributed by Louisiana Power Co. It was stapled in this month's employee magazine.

Art Godfrey, the TV and radio personality, told his public, "We regard Con Edison with a great deal of affection" when he interviewed Con Ed's TV weather man. He went on to say about the New York utility, "Everybody who works for them is crazy about them."

More than 11,000 visitors turned out when Union Electric of Missouri invited its customers to visit its plants.

Regular utility employees make up the cast of Boston Edison Co's TV cooking show, now in its sixth year. Home economists from the company's home service division are the stars.

Consumers Power Co, Jackson, Mich, seized on public curiosity to display a new order of plastic power poles. Several school groups came out to see this new product after they had read about it in newspapers and magazines.



Stronger than the pin that supports it

SO STRONG . . . Torque test shows strength sufficient to strip threads on lead bushed pins and actually twist pole top steel pins.

This great strength saves installation time. It is not necessary to loosen Kimble tempered insulators for line-up with the conductor. Their strength will always allow another quarter-turn.

If it's on the pin, it's in service

In the event of shattering due to severe mechanical shock, insulator disintegrates into many small, non-sharp fragments. Trouble shooters can locate broken insulators—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

Why not see how tempered glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dpt. EW-10, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES • TOLEDO 1, OHIO

M. S. COOVER, AIEE president, presents first Member-for-Life Fund medal and citation to F. E. Terman, dean of School of Engineering and provost of Stanford University as W. C. White, chairman of the award committee, looks on. The award was made for "notable attainments in the field of engineering education"

Capacitive Switching Data Compiled

A. J. Schultz, General Electric, reporting for an AIEE working group, said that switching surges had been classified and that the group's work was now chiefly studying capacitive switching surge data. Data were accumulated from tests on actual systems and from analog computer studies. The report presented by Schultz included tables on voltages and frequencies due to breaker restrike when switching overhead lines, cables, and capacitor banks. A table on capacitive switching surges determined from field measurements and due to restriking during line de-energization was also included.

Nearly half (45.8%) of all the automatically switched capacitors are controlled by time clocks, B. H. Schultz, Line Material, said in reporting on a survey of 52 systems by the working group of the AIEE capacitor subcommittee.

Experiments with the interruption of capacitance charging currents in sulphur hexafluoride (SF_6) and the design of a circuit breaker using SF_6 as the arc interrupting medium were the subjects of companion papers presented by T. E. Browne, Jr., and R. E. Friedrich, Westinghouse. Browne said that SF_6 has particular advantages when switching leading power factor loads. Recovery, said Browne, is more rapid than in air, and this is due to increased density of the gas because of cooling. Use of SF_6, said Browne, offers the possibility of a design procedure to prevent restrikes. It is a nearly ideal medium for capacitance load switching.

Friedrich described a new 115-kv, 1,000-Mva breaker which uses SF_6 at 45 psig as the interrupting medium. This breaker, said Friedrich, is a low-cost unit and is restrike free when interrupting fault currents and switching single or parallel banks of capacitors.

A new type of telescoping bus duct was described by K. Boyajian, H. K. Porter Co, that is designed so that it can be easily installed and readily inspected. The design permits closer spacing of bus ducts. The duct is made of sheet aluminum, formed into a cylinder and seam welded.

Study Surge Effects on Transformers

J. S. Kresge, General Electric, reported on a series of tests on all types of power transformer insulation, uniform and non-uniform. Tests were directed at the study of the long duration switching surges and their effect on transformer insulation and were prompted by proposals of the past few years to reduce transformer BIL's two steps. Test data were related to the ratio of the impulse test voltage to the 60-cycle crest voltage. Lowest average ratio for all samples tested with long front waves was 1.4. Individual ratios were as low as 1.1. The tests indicated that for long front waves, representative of the first half cycle of a switching surge, the tail does not have an appreciable influence on the breakdown strength.

F. J. Vogel, Allis-Chalmers, said that it was not possible to confirm data in the report because no actual values were given. Results, however, are encouraging and indicate that transformer leads may have impulse strengths up to 1½ times the 60 cycle values.

P. L. Bellaschi, Bonneville Power Administration, urged the apparatus standards committee to describe switching surge strength for insulation coordination and to facilitate the move to higher voltages.

Transil oil tests, made to determine the relative merits of different types of gaps to determine oil quality, showed that the spherically capped electrodes (SCE gap) were superior to the standard ASTM gap, said A. F. Rohlfs, General Electric Co. Tests were conducted by varying moisture content of the oil to vary its quality.

To Become Professional Engineers Need Ethics

P. L. Alger of General Electric, chairman of the session on ethics, urged a positive approach to ethics for engineers. He said that in approaching the problem, we should set forth the things that are right for engineers to do, as well as what they should *not* do.

O. H. Hall, speaking as a member of the Ethical Practices Committee of the National Society of Professional Engineers, said the NSPE plans to publish a brochure on rules of professional conduct for engineers. Hall said that interest in ethics is "a must" if engineers want to be considered professional.

C. J. Freund of the University of Detroit denounced the ethics of employers who: exaggerate conditions of employment; entertain extensively and pay grants or bonuses beyond travel expenses for interviews at the plant, also payment of fees to students for promising to join an organization.

WHY . . . more hardware performance per dollar with M|F MALLEABLE IRON

All iron and steel starts out in the molten state. Malleable iron is cast directly into a designed — *finished* piece, then hot dip galvanized. Rarely are machining or finishing operations required.

Steel is cast, then, in addition — sheeted, rolled, cut, stamped, punched, or forged, or machined, or welded, and finally — after many operations the hardware is galvanized.

M.I.F. foundry techniques eliminate these *extra* operations, and at the same time allow designing and casting the shapes that provide better performance and easier, faster installations. Those economies, plus high corrosion resistance, are why MALLEABLE IRON POLE HARDWARE gives more performance per dollar. Our new illustrated price list will *prove* it. Send for your copy!

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Incentive for Executives: The Stock Option

Montana Power reports promising results from its recently created "Key Employee Stock Ownership" program. Key management men are granted options on blocks of company stock at 95% of market quotations

A restricted stock option plan is getting its first electric utility tryout at Montana Power Co. Known there as the "Key Employee Stock Ownership Plan," the program has been in effect since Federal Power Commission cleared the way for it in August. The company will issue 100,000 shares of common stock for use in this program.

Under the Montana Power plan, stock options are awarded to a limited number of key employees by action of the Board of Directors. Such options are dependent upon the employees remaining with the company for a period of two years from the date of grant and cannot be exercised prior to that time except in case of the death of an employee holding a grant.

Option price is 95% of the closing price of the stock on the New York Exchange on the date of grant. Options may be exercised at this option price by the employee at any time from two years after the date of grant to ten years after that date. Options may be exercised for all or part of the stock, but the purchase price must be paid in full at the time of exercise. Employees must also signify their intent that they are not purchasing this stock for speculative purposes, and it is the hope of management that the major portion of the stock will be held permanently.

At present stock options have been issued to 61 executives out of a possible maximum of 80. Approximately 38,000 of the 100,000 shares available for this purpose have been optioned. The plan runs for five years from the date of approval. It is anticipated that further options will be granted as additional incentive to executives who may have already received some options and to new or rising executives.

Applications Made First

To get the plan underway, the Board of Directors asked for applications for options from the executive group considered eligible for them in order to approximate the purchasing power of the executives. In this way the board avoided the possibility of overloading an executive with options which he would be unable to exercise.

The stock option plan is accompanied by the "Employees Stock Purchase Plan," which is available to all company employees. Under the purchase plan, common stock of the company may be purchased at any time and financed on the installment plan by payroll deductions. Already over 50% of the company's regular employees are participating in the purchase plan, holding some 25,000 shares of common stock.

Helps Supervisory Efficiency

Company officials believe these two plans have substantially increased the interest of the employees in the affairs and financial condition of the company. The stock option plan for executives is believed to have increased supervisory efficiency. It is credited with helping the company to gain high praise from the American Institute of Management.

Although Montana Power is pioneering the stock option plan among electric utilities, similar plans are quite common among industrial and mercantile concerns. In fact, it has recently been said that no industrial concern can expect to engage a top officer without offering him a stock option. The reason for this is the success of

City Customers Must Bear City Taxes

The Wyoming Public Service Commission has authorized Montana-Dakota Utility Co to pass on to all power and gas consumers in the Sheridan, Wyo., area the costs of franchise payments it makes to the city of Sheridan.

But the PSC also ruled that excise taxes imposed on the utility by the city of Sheridan could be passed on only to city consumers on a pro rata basis.

The PSC said the franchise contract between Sheridan and MDU, calling for the utility to pay 1% of its gross receipts in exchange for use of Sheridan streets and alleys, can be charged off as a business expense and reflected in bills to consumers in Buffalo, Kaycee and several other neighboring communities.

However, the recently-imposed Sheridan occupation tax of $15,000 yearly on MDU's electrical business, and $15,000 on its natural gas operations, can be passed on only to utility subscribers within the Sheridan city limits. MDU was also authorized to charge Sheridan subscribers 2% of the tax, or $600 a year, for accounting costs.

The PSC decision noted a movement of Wyoming cities toward taxing utilities as a means of raising revenue without hitting the taxpayer's pocket.

"Cities have singled out utilities as a new source of municipal revenue and the utilities have no control over taxes or where they may be imposed," the PSC said. "Apparently the courts can't regulate these taxes and the legislature hasn't set any limits on municipal-taxing power.

"Consequently the PSC feels that Montana-Dakota Utilities is justified in charging its customers on a pro rata basis any municipal tax aimed at raising revenue."

The PSC also ruled that any franchise payments more than 1% of the gross revenue would be considered as an excise tax. The commission said it considered the 1% gross receipts tax a "reasonable amount" for use of the city's streets and alleys.

the stock option as a reward to management.

Compensation in this form does not involve the heavy income tax penalties that attach themselves to regular compensation. Under such a plan, an executive is able to build up a substantial estate for his family without income tax penalty, or if he sells the stock which has been optioned to him, he may usually take the gain under the capital gains provision of the income tax law at a maximum rate of 25%.

Such plans have been used widely to attract new executives and to hold those already on the staff. This explains its use by industrial firms facing keen competition for executive talent. Montana Power President J. E. Corette has felt that his company should be in a position to use such a device should the same sort of competition become more prevalent in the electrical industry. He also considers the stock options provide a valuable incentive towards improved executive performance for existing key personnel.

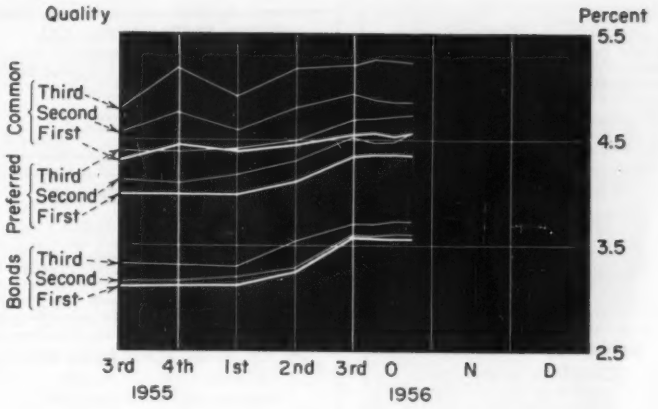
Montana Power's plan, devised by Corette in 1954, received board and stockholder approval in that year. In addition to approving the plan, the stockholders relinquished preemptive rights on the block of stock necessary to implement the plan.

FINANCIAL BRIEFS

Central & South West Corp will pay November 30 a quarterly common stock dividend of 40¢ a share as compared with 35¢ in the previous quarter.

First Boston Corp and Glore, Forgan & Co has reported that the offering of 400,000 **Commonwealth Edison Co** 4.64% non-convertible preferred stock at $100 a share has been oversubscribed and the books closed. . . . **Long Island Lighting Co's** common stockholders subscribed for 56,865 preferred shares of 180,000 offered on the basis of one preferred share for each 38 common shares. The preferred stock carried a 4.40% dividend and sold at par. The 123,135 unsubscribed shares were purchased by the underwriters, Blyth & Co, First Boston Corp and W. C. Langley & Co and associates.

Today's Utility Yields (%)



	Bonds			Preferred Stocks			Common Stocks		
Quality	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Oct. 18	3.57	3.60	3.72	4.36	4.53	4.72	4.53	4.84	5.21
Oct. 11	3.57	3.60	3.72	4.37	4.48	4.71	4.52	4.84	5.23
Oct. 4	3.59	3.60	3.72	4.36	4.49	4.71	4.56	4.89	5.24

Utility Earnings . . .

Company	Period Months	Ended	Net Income 1956	Net Income 1955	Earnings Per Common Share 1956	Earnings Per Common Share 1955
American & Foreign Power, corporate	12	Aug.	$10,398,788	$9,294,600	$1.44	$1.29
Arizona Public Service	12	Aug.	6,334,000	5,052,000	1.62(a)	1.37(a)
Carolina Power & Light	12	Sept.	10,033,038	8,827,501	1.74(b)	1.60(b)
Central Illinois Light	12	Sept.	5,049,357	3,668,227	4.29(a)	3.17(a)
Central Vermont Public Service	12	Sept.	1,375,002	1,427,431	1.23(a)	1.31(a)
Detroit Edison	12	Sept.	28,291,850	25,466,730	2.44(a)	2.36(a)
Houston Lighting & Power	12	Sept.	17,062,781	14,157,204	2.86	2.36
Kansas City Power & Light	12	Sept.	9,151,702	7,646,888	2.78	2.31
El Paso Electric	12	Aug.	2,475,286	2,091,346	2.58(c)	2.33(c)
Florida Power & Light	12	Sept.	16,006,256	13,006,136	2.40	1.93
Gulf States Utilities	12	Aug.	10,920,670	10,101,700	2.22	2.03
Minnesota Power & Light	12	Sept.	4,129,569	3,914,455	2.07	1.94
Mississippi Power & Light	12	Sept.	4,482,342	4,001,992	....	....
Montana Power and subsidiaries	12	Sept.	8,963,952	8,426,579	3.12	2.91
New York State Electric & Gas	12	Sept.	11,282,723	10,524,375	2.90(h)	2.94(h)
Ohio Edison, consolidated	12	Sept.	24,354,326	22,750,467	3.72	3.44
Oklahoma Gas & Electric	12	Sept.	9,330,927	8,085,603	2.43(f)	2.24(f)
Pacific Power & Light	12	Aug.	7,471,321(g)	6,293,650(g)	1.81(g)	1.66(g)
Pennsylvania Power	12	Sept.	2,969,871	2,775,440	....	....
Portland General Electric	12	Sept.	5,087,115	4,871,837	1.70	1.62
Public Service Co of New Hampshire	12	Sept.	4,198,978	4,237,849	1.22(a)	1.37(a)
San Diego Gas & Electric	12	Aug.	6,997,837	5,133,145	1.52(a)	1.06(a)
Southern Colorado Power	12	Aug.	1,003,865	964,778	1.24	1.25
Southern Co, consolidated	12	Sept	29,502,657	25,145,781	1.50	1.39
Tampa Electric	12	Sept.	3,914,627	3,281,414	1.61(i)	1.44(i)

Notes—(a) Based on average number of shares outstanding; (b) Based on 4,830,000 shares in 1956 and 4,600,000 shares in 1955; (c) Based on 896,412 shares in 1956 and 840,387 shares in 1955; (f) Based on 3,283,262 shares in 1956 and 2,984,783 shares in 1955; (g) After provision for deferral income taxes resulting from accelerated amortization, based on 3,757,050 shares in 1956 and 3,405,737 shares in 1955; (h) Based on 3,337,475 shares in 1956 and 3,034,068 shares in 1955, and (i) Based on 2,172,855 shares in 1956 and 1,978,683 shares in 1955.

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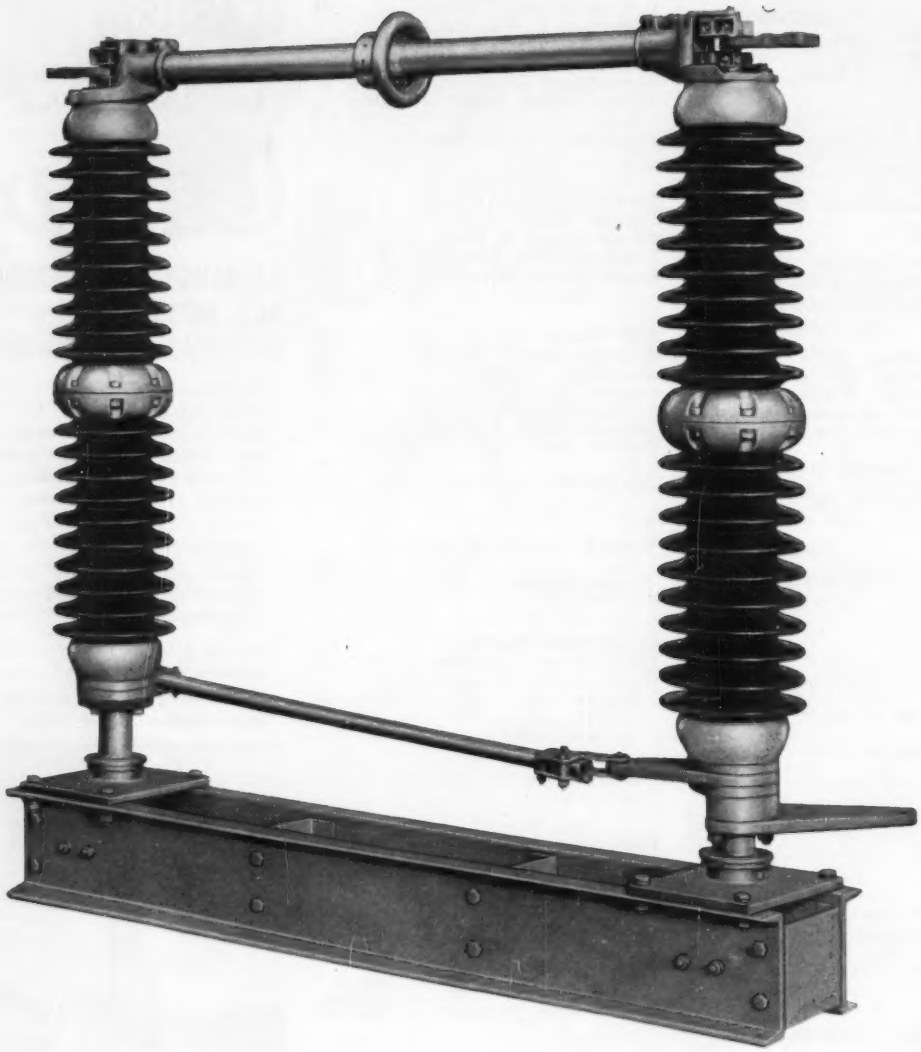

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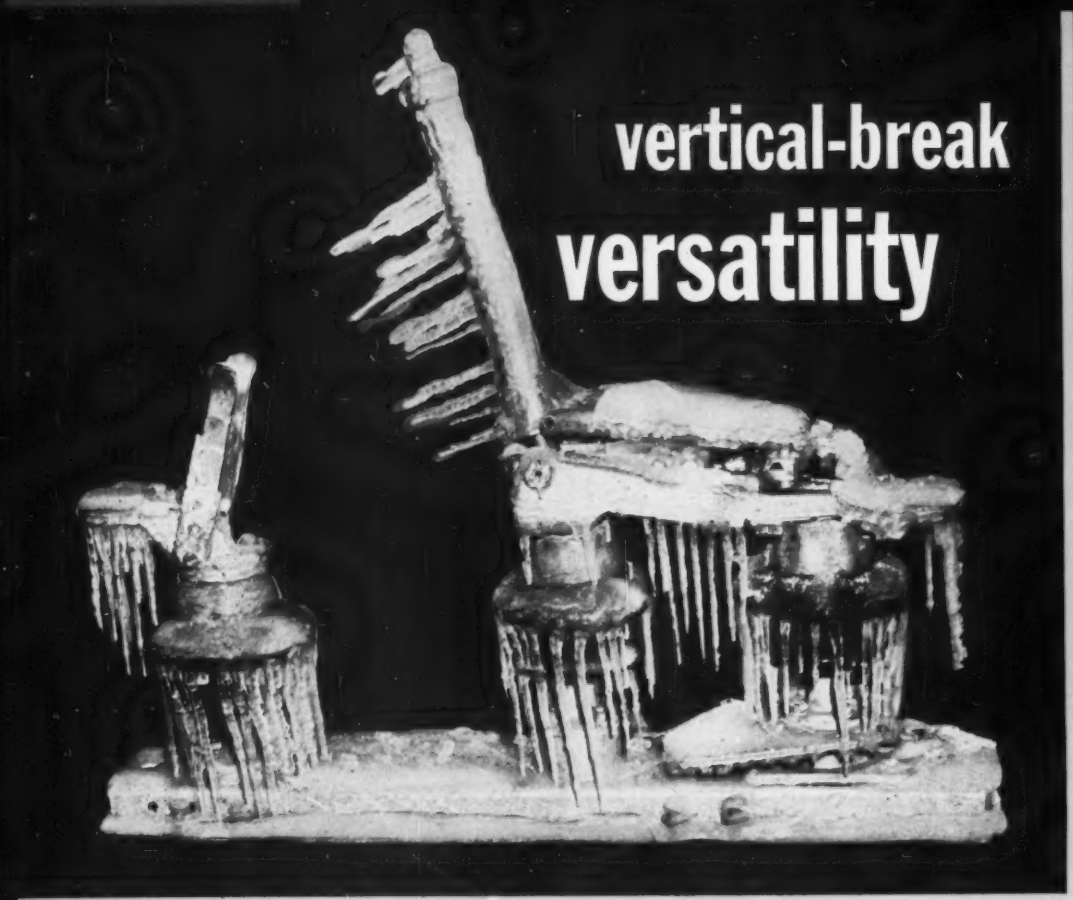

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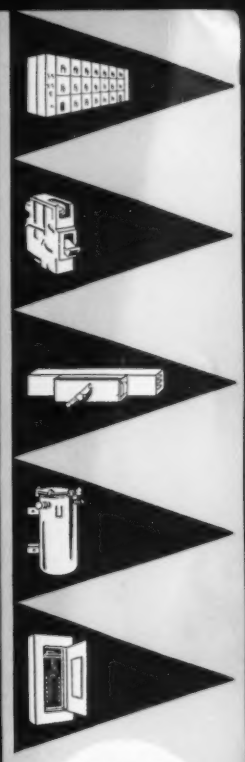

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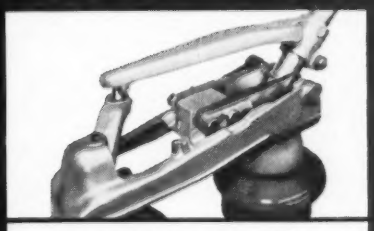

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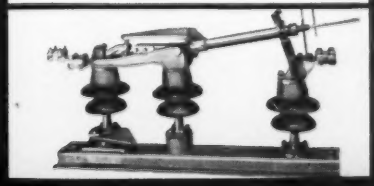

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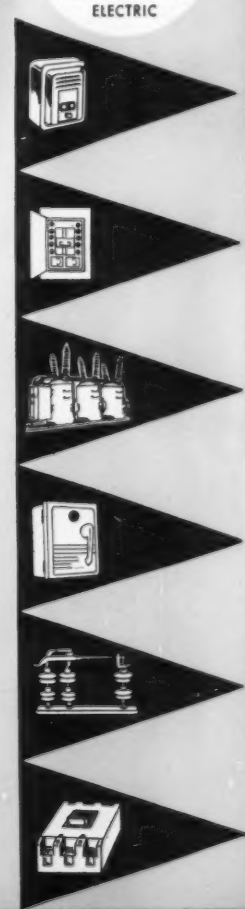

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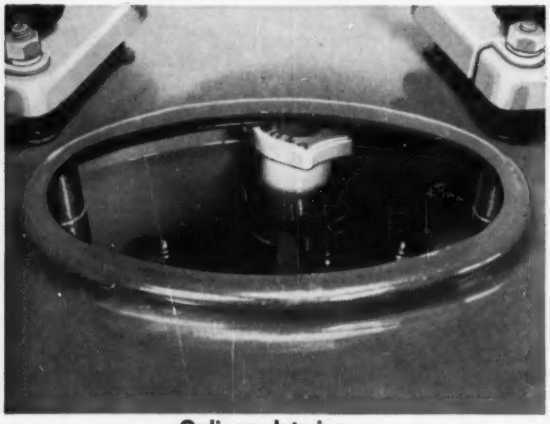

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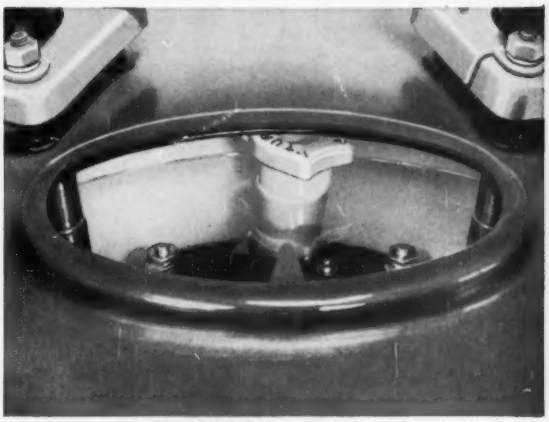

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